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ABSTRACT

Reported is a project designed to correlate six units of study from the Philadelphia Elementary Science Guide and to incorporate them in such a way as to reduce the suggested 32 weeks of teaching time, for the individual units, to 10 weeks for all 6 units. This was necessitated by an interruption of the school year by a teachers' strike. Three objectives guided the project: (1) to insure that children would obtain the basic science skills contained in the Elementary Science Primary Unit of the Philadelphia Public Schools, (2) to enrich the scientific course of study, and (3) to test the worth of open classroom techniques in a traditional setting. The major objective for the teachers was to extend the knowledge of newly developed scientific concepts wherein it might enable them to better prepare their pupils to meet the scientific age. Descriptive information is provided for the Primary Science Unit and the Primary Ecology Unit, including concepts involved, steps of organization, correlation of subject matter, and culminating activities for each of the two units. Appendices to the report contain such materials as vocabulary lists, activity sheets, games, maps, and other related activities. (PEB)

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AN EXPERIMENTAL SCIENCE PROGRAM WITH THE OPEN CLASSROOM APPROACH BASED ON THE PHILADELPHIA PRIMARY SCIENCE GUIDE

Part I--Primary Science Unit
Part II--Primary Ecology Unit

by

Jeanette Quinn and Elaine Carty

Spring Garden School
Spring 1973

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A NOTE ABOUT THE ILLUSTRATOR

Mary Gail Murphy was born in Boston, Massachusetts, on September 10, 1940. She attended the University of Dallas, in Irving, Texas, from 1960 to 1965, then transferred to Midwestern University in Wichita Falls, Texas. There she received a Bachelor of Science Degree in Art.

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Out of her very busy schedule she took of her time to become involved in the production of this unit. Therefore, it is with the utmost of our appreciation and love that we make this note to the illustrator.

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PART I

PRIMARY SCIENCE UNIT

CHAPTER I

OVERVIEW

Purpose

As the writers reflect this past school year (1972-73) of learning, it is alarming to note that the most outstanding achievement has been the loss of time for the children and the missing of those educational benefits which were dearly needed by those same children. And yet, the time which should have been devoted to the children of the Philadelphia School System was gone; hopefully, with the concentrated effort that has been planned, the educational benefits can be restored.

The object of this project was to correlate six units of study from the Philadelphia Elementary Science Guide and to incorporate them in such a way as to reduce the suggested thirty-two weeks of teaching time, for the individual units, to ten weeks for all six units. This would afford the children the units missed during the strike and guarantee that the requirements of teachers, by the board of education, would also be satisfied.

In order to cover these units thoroughly, the teachers decided to place the basic concepts of the

Philadelphia Elementary Science Guide into six learning centers. In this way the children could receive immediate rewards and continuous appraisal for work performed.

It was then decided to reinforce the Center's concepts through teacher-directed lessons which would occur on the days other than when the Centers were available.

Objectives

The objectives for the children were: first, to insure that they would obtain the bare science skills contained in the Elementary Science Primary Unit of the Philadelphia Public Schools; second, to enrich the scientific course of study; and third, to test the worth of open classroom techniques in a traditional setting.

The teachers' objective was to extend the knowledge of newly developed scientific concepts wherein it may enable them to better prepare the children to meet the scientific age.

The long-range objective for the teachers, then, was two fold--to combine both methods of instruction to reinforce the guide's concepts and also to formulate one totally new unit of study. Hopefully, this would provide the children with the skills and concepts necessary for their best education and interest. It would also meet and satisfy the work requirements for the teachers in the Philadelphia School System.

Rationale

The children of the first and third grades could work together successfully because the skills taught covered a span of three years. The concepts involved were initiated and developed for first-year students and introduced, reinforced, and enriched for third-year students.

CHAPTER II

CONCEPTS

This chapter lists the concepts of the Philadelphia Primary Science Guide, the concepts of the Learning Center, and a correlation of the two.

Philadelphia Primary Science Guide Concepts

Air, Water, Weather--First Year

1. We need to wear different clothing for different weather.
2. The weather changes often.
3. There are different kinds of weather.
4. Weather is the condition of the air.
5. Air is all around us.
6. Air cannot be seen.
7. Air takes up space.
8. Wind is moving air.
9. Wind can make noise.
10. Wind can move things.
11. Wind can be felt.
12. Rain and snow come from clouds.
13. Rain and snow are wet (they are forms of water).

14. Clouds are made of floating droplets of water.
15. There are various kinds of clouds.
16. Raindrops fall from clouds when the water droplets combine to form larger water drops.
17. There is water in the air.
18. Water vapor is a gas.
19. Water has three forms: ice, water, and water vapor.
20. Rain water goes to many places.
21. People, plants, and animals must have water.
22. Clouds can hide the sun.
23. Weather affects everyone.
24. There are four seasons in our part of the world: summer, fall, winter, and spring.
25. The changing seasons affect living things.

The Sky--Second Year

1. We see the sun shining on clear days and the stars on clear nights; we see the moon sometimes at night and sometimes by day.
2. The sun gives us heat and light.
3. The sun is the brightest light we know.
4. The sun is shining all the time.
5. The sun is a star.
6. We see the sun coming up south of east, going down south of west, where we live.
7. The sun makes shadows.

8. Shadows point in different directions through the day.
9. The sun, moon, and stars are large; they are far away.
10. We see the moon in different shapes.
11. The moon is the earth's nearest neighbor.
12. The moon has no light of its own.
13. There are many stars.
14. Stars are far away; therefore, they give us little light.
15. The North Star helps us find directions.
16. The Big Dipper helps us find the North Star.
17. Stars appear to us grouped in constellations.

Space--Third Year

1. A layer of air surrounds the earth; beyond this layer is outer space.
2. Rockets reach outer space by overcoming the pull of gravity.
3. Rockets carry man-made satellites into space.
4. Instruments in satellites obtain and transmit information about space.
5. A man-made satellite in outer space travels in an orbit around a heavenly body.
6. Man is developing ways of overcoming problems of space travel.

Earth's Crust--Second Year

1. We live on the earth.

2. Land, water, and air make up the earth.
3. People live on the land.
4. The surface of the earth is different in different places.
5. The earth is very big; it is somewhat like a gigantic round ball.
6. Land is made of soil, rock, and sand.
7. Soil covers most of the rocks.
8. Rocks are found in many places.
9. Solid rock is under land and sea.
10. There are different kinds of rocks.
11. The earth is very old.

Earth's Crust--Third Year

1. The earth is one of the planets.
2. When one part of our earth has day, the opposite part has night.
3. The earth moves all the time.
4. The earth moves quickly.
5. Gravity holds everything to the earth.
6. The greater part of the earth's surface is covered by water.
7. There are different kinds of soils.
8. Soil is made of sand, clay, and decomposed products of plant and animal life.
9. Rocks are broken by heating and cooling, the action of the wind, water, growing plants, and animals.

10. Rocks make sand and clay.
11. Minerals are found in rocks.
12. Salt is a mineral; it dissolves in water.
13. Rivers carry minerals to the sea.
14. The sea is salty because of the dissolved minerals in it.

Animals--First Year

1. There are many kinds of animals.
2. They are of different sizes and shapes.
3. Animals have different parts.
4. Animals have different coverings.
5. Animals move in different ways.
6. Animals live in different kinds of homes.
7. Some animals live on land; some live in water; others live on land and in water.
8. All animals need food, air, water, and warmth.
9. Pets need care.
10. Some animals eat plants; some eat other animals; some eat both plants and animals.
11. During winter some animals take a long sleep; some are comparatively inactive, some remain fully active.
12. Some animals migrate before winter.
13. Birds and other animals have a heavier coat during winter.
14. Some animals change color for the winter.

15. Some animals store food for the winter.
16. Sleeping animals awaken in the spring.
17. Migrating animals return in the spring.
18. Animals shed their heavy coats in the spring.
19. Some animal babies hatch from eggs; some are born alive.
20. Most animals have their babies in the spring.
21. Animal babies grow up to look like their parents.
22. Some animal babies are born helpless. The mothers must feed, protect, teach, and provide warmth.
23. Some animals get milk from their mothers.
24. Some animal babies need little or no care.
25. Some animals give us food and clothing.
26. Some animals do work for us.
27. Some animals add beauty and enjoyment.

Animals--Second Year

1. Animals eat and drink in different ways.
2. Animals have various ways of protecting themselves.
3. Animals find or build homes of different types.
4. Animals live in different places.
5. Insects are animals.
6. All insects have six legs that are in sections.
7. The bodies of insects are in three sections.
8. Some insects lay eggs and die in the fall.
9. Insect eggs that are laid in the fall hatch in the spring.

10. Some insects hibernate; some butterflies migrate.
11. During winter some animals hibernate; some remain active; others are less active.
12. Some animals collect and store food for the winter.
13. Birds and furry animals have a heavier coat during winter.
14. Some animals eat a great deal in the fall and grow fat.
15. Some animals change color for the winter.
16. Some animals migrate before winter.
17. People make use of animals in many ways.
18. We provide homes for our pets.
19. In the spring, hibernating animals awaken; migrating animals return.
20. Some animals shed in the spring.
21. Most animals have their babies in the spring.
22. Some animals care for their babies; some animals do not.
23. Migrating insects return in the spring.
24. In the spring hibernating insects awaken and lay eggs.
25. Insects hatch from eggs.
26. Upon hatching, some insects resemble their parents.
27. Some insects hatch from eggs and go through one or more changes.
28. Most caterpillars eat leaves.
29. Some caterpillars spin cocoons and come out as moths.

30. Some caterpillars change into butterflies.
31. Some insects are useful.
32. Some insects are harmful.

Animals--Third Year

1. Some insects pass through four stages to reach adulthood.
2. Some insects are social animals.
3. Some insects are parasites.
4. Bees and ants live through the winter on food stored in their homes.
5. Some insects are useful; some are harmful.
6. Many animals eat insects.
7. Fish have fins and scales.
8. Fish use their gills to obtain oxygen from the air which is dissolved in the water.
9. Female fish lay hundreds of eggs in the water.
10. Some fish eat plants and other things, many fish eat other fish.
11. Most fish give no care to the young.
12. Fish are cold-blooded.
13. Some fish migrate.
14. "Amphibian" means "living both ways": as water animals while young; as land and water animals as adults.
15. Frogs, toads, and salamanders are amphibians.
16. Amphibians have skins without scales.

17. Mature females lay thousands of eggs in the water.
18. Tadpoles, which hatch from amphibian eggs, have gills and get oxygen from the air dissolved in the water. They use their long tails to swim; they usually eat minute animal life and plant life.
19. Tadpoles receive no care from the parents.
20. As tadpoles change to frogs or toads, they use up the supply of food material in their tails.
21. When tadpoles develop lungs and legs, they can also live on land; they feed on insects.
22. Amphibians are cold-blooded, and hibernate.
23. Amphibians have various forms of protection.
24. All reptiles have scale skins, lungs, and breathe air.
25. Turtles, lizards, alligators, crocodiles, and most snakes lay eggs on land.
26. When reptile eggs hatch, the young resemble their parents.
27. Reptile parents give no care to their young.
28. Reptiles eat plants, insects, and other animals.
29. Reptiles have various ways of protecting themselves.
30. Reptiles are cold-blooded.
31. Birds are covered with feathers.
32. Birds have lungs and breathe air.
33. Birds have hollow bones.
34. Birds have different kinds of beaks which equip them for feeding on different foods; they have no teeth.

35. Different kinds of wings make possible different kinds of flight.
36. Birds' feathers are oily.
37. The structures of birds' feet differ (webbed, clawed, etc.).
38. Some birds migrate; others do not. In the spring, birds make different kinds of nests in various places.
39. Female and male birds of some varieties have similar colorings.
40. Most female birds are less brightly colored than male birds.
41. Birds are warm-blooded and remain active all year.

Plants--First Year

1. Plants change with the seasons.
2. Leaves are green during late spring, summer, and early autumn in this climate.
3. The leaves of some trees change color and fall in the autumn.
4. Most grass turns brown in the fall.
5. Some plants stay green throughout the year.
6. Some plants die in winter; these make seeds before winter.
7. Some plants sleep through the winter.
8. Trees make leaf buds before winter.
9. Some plants give us food or clothing, or both.

10. Many animals use plants for food.
11. Plants often make our surroundings beautiful.
12. There are many different kinds of plants.
13. Trees are plants.
14. Plants have different parts.
15. Plants are living things.
16. Where we live, plants grow outdoors in the spring and summer.
17. Some plants grow from seeds; some do not.
18. There are baby plants inside seeds.
19. There are many kinds of seeds.
20. Plants need air, light, water, and warmth to grow.
21. Some plants need our care.
22. Most plants need soil.
23. Plants change as they grow.
24. Plants live in different places.

Plants--Second Year

1. One plant produces many seeds, because most seeds do not find favorable conditions for growth.
2. Seeds are carried in many different ways.
3. Trees make seeds in the fall and spring.
4. Nuts are seeds.
5. Some plants blossom in the spring; others blossom in the summer or fall.
6. Flowers make seeds.

7. The growth of plants changes with the seasons.
8. Plants are used in many ways.
9. Different parts of plants are used as foods.
10. Some plants are beautiful to look at; some are pleasant to smell.
11. Plants provide shelter and food for birds and other animals.
12. Different kinds of plants grow best in certain soils and in certain places.
13. Plants need food; plants get minerals from the soil.
14. Plants need air, light, warmth, water, as well as the minerals from the soil.
15. Nature provides for many outdoor plants; indoor plants need care.
16. Seeds grow into plants that produce more seeds.
17. Seeds need warmth and moisture to sprout.
18. Seeds normally send out roots, stems, and leaves.
19. Roots tend to grow down and toward water and mineral foods.
20. Stems and leaves turn up and grow toward light.
21. Plants have special parts to help them live.
22. Each part of the plant has special jobs to do.

Plants--Third Year

1. Each kind of plant grows best in certain places.
2. Plants have special parts to help them live in certain places.

3. Each part of the plant has special jobs to do.
4. Water and minerals enter plants through their roots.
5. Green plants make their own food in their leaves with the help of sunlight; some of this food is sugar.
6. Some plants that cannot make their own food obtain food from other plants.
7. Seeds that ripen in the spring grow during the same season.
8. Seeds that ripen in the fall grow during the following spring.
9. Some plants can be grown from cuttings.
10. Man uses various plants for food, clothing and shelter.
11. We eat different parts of plants.

Learning Center's Concepts

Animals

1. Living things are either plants or animals.
2. Plants and animals differ greatly in size and shape.
3. All living things need food, water, and, with few exceptions, air.
4. All living things reproduce.
5. Food provides the energy man uses in moving.
6. There are many different kinds of animals: mammals, fish, amphibians, reptiles, birds, and insects.

Sky and Water

1. Stars are trillions of miles away from earth.
2. The sun is a star.
3. The earth rotates on its axis once every twenty-four hours; this rotation causes day and night.
4. The sun is the primary source of energy for the earth and the other planets.
5. The moon is the earth's only natural satellite.
6. The moon revolves around the earth about once a month.
7. People, plants, and animals must have water.
8. Water has three forms: ice, water, and water vapor.

Plants

1. Plants are living things.
2. Different types of plants grow in different environments.
3. Green plants use energy of sunlight in making their own food.
4. Man uses plants for many purposes.

Earth's Crust

1. The earth is very old.
2. The surface of the earth is different in different places.
3. Many things change the earth's surface: among these are wind, water, living things, and temperature changes.

4. Many agents including air, water, living things, and temperature changes are constantly changing rocks into soil.
5. Soil is made of clay, sand, and decomposed products of plant and animal life.
6. The atmosphere is the air, or gas portion (part) of the earth.

Weather and Air

1. Weather affects everyone.
2. Weather is a condition of the air.
3. Wind is moving air.
4. There are various kinds of clouds.
5. Rain and snow come from clouds.
6. The changing seasons affect living things.

Space

1. A layer of air surrounds the earth; beyond this layer is outer space.
2. The sun is the central body in the solar system.
3. The earth is a planet in the solar system.
4. The time it takes for the earth to orbit the sun once is a year.
5. Gravity holds objects on the earth.
6. Gravity holds the atmosphere around the earth.

Correlation of Ecology Concepts to the Philadelphia Primary Science Guide

In order to show the correlation between the Philadelphia Primary Science Guide and the teacher-directed lessons of the cycles, a numbering system was designed. The concept of each unit of study in the Guide was given a number which indicated the concepts of the Guide covered by the teacher in her lessons. The balance of the concepts were covered in the development of the Learning Centers. Charts 1, 2, and 3 cover the Water Cycle, the Food Chain Cycle, and the Nitrogen Cycle, respectively.

Chart 1

Water Cycle

Topics	Grade	Concepts
Air, Water, & Weather	1	All
Sky	2	All except 7, 8, 13-17
Space	3	Only 1 & 2
Earth's Crust	2	All
	3	All except 10 & 11
Animals	1	None
	2	None
	3	7-13
Plants	1	None
	2	None
	3	4 only

Chart 2

Food Chain Cycle

Topics	Grade	Concepts
Air, Water, & Weather	1	2-7, 12, 13, 20-25
Sky	2	2
Space	3	None
Earth's Crust	2	2-4
	3	7-9
Animals	1	1-10, 12, 17, 25
	2	1-7, 11, 19
	3	6,7,14,15,16,27,30,37,41
Plants	1	All
	2	All
	3	All

Chart 3

Nitrogen Cycle

Topics	Grade	Concepts
Air, Water, & Weather	1	4-8, 10, 12-21, 23
Sky	2	1-7
Space	3	1, 6
Earth's Crust	2	All
	3	All
Animals	1	All
	2	All
	3	None
Plants	1	All
	2	All
	3	All

CHAPTER III

STEPS OF ORGANIZATION

The unit was initiated differently by each grade, yet simultaneously. The first grade went to the Civic Center for a lesson on "Farming." The third grade was motivated by their Social Studies Unit, "Learning About a Community." That area in the unit, which went into the cultural and physical aspects of a community, was their springboard.

The two initiating activities were done so simultaneously that the teachers were able to launch the Ecology Unit at the same time.

Teacher's Responsibilities

Just as basic areas of work would be established and then allocated for the pupils (for the purpose of accountability, security, and maintenance of interest), it was necessary then, for each teacher involved, to also be guided by these same requirements.

The areas of concern necessitated that fine-line tasks be delineated and selected by each teacher in accordance with her strengths and needs.

Each teacher was then expected to move with a combined purpose of thought and action for the total involvement and commitment to the children.

Delineation of Responsibilities for Teachers

Socialization

1. Interaction was encouraged among the group through games, activities, and lessons.
2. Respect for the rights and needs of others was reinforced.
3. Interaction between pupils and pupil-teachers was established by the responsibilities and authority given to the pupil-teachers to teach their pupils.
4. Courtesy to one another was encouraged.
5. Working with peers in bi-grouping or in large groupings of children was fostered.
6. Following instructions given by peers, without hesitation, was enforced.

Motivation

1. A grown-up atmosphere for pupils was established.
2. A high expectancy level for teachers and children was established.
3. Exciting lessons were presented to interest and involve children.

4. Located interesting things for the children, such as ecology pins, ecology stamp, popular literature, and popular music.

Procedure and Organization

1. Organized the ecology kits and the procedure to be followed.
2. Organized the room for sixty-four children--seating arrangement, discipline, and fluid movement about the room, and learning centers.
3. Organized how pupil-teachers conducted themselves with their pupils, where they were to meet them and return them.
4. Prepared children for learning centers.
5. Taught children how to ask and answer questions.
6. Involved many aspects of the curriculum.
7. Instructed less experienced teacher as to the format and content of lessons to be presented, and gave example through teaching of lessons.
8. Arranged learning centers.

Art

1. Made mobiles.
2. Read stories.
3. Made word and picture puzzles.
4. Made charts.
5. Made rosters.

6. Made flash cards.
7. Made ecology notebooks.
8. Made area indicators.
9. Made flannel word cards.
10. Made bulletin boards.
11. Played games.
12. Made a simulation of atmosphere.
13. Made diagrams.
14. Made sure necessary supplies were available.

Communication and Purchasing

1. Wrote letters to interested officials (see Appendix T).
2. Wrote letters for information (see Appendix T).
3. Bought supplies for interest areas and learning centers.
4. Did necessary rex-o-graphing.
5. Made phone calls.
6. Made arrangements for resource person (137).
7. Bought refreshments.
8. Made arrangements for observations of other classes.
9. Arranged to bring things from home--like soil, peat moss, jars, and shoe boxes.

Research

1. Located information for teaching of lessons--books, films, records, slides, magazines, pamphlets, resource people, and filmstrips.
2. Located library books and pictures for the children.

Teacher Preparation for Interest Areas

As a prelude to the establishment of learning centers, four interest areas were formed. "Signs of Spring" was chosen as the main topic for the interest areas because of the time of year. The most obvious signs of spring were forsythia, daffodil, buds, and soil.

A vocabulary was developed for all four areas. The name of the interest area and vocabulary chart were placed in each area. Short stories and activities were developed for each area.

Activity sheets were rex-o-graphed for each child. Questions on the activity sheets were based on the Individual Reading Inventory, Philadelphia Guidelines, and materials were placed in each area and labeled. Each area contained check sheets for the teachers to keep records of who had completed the area and to establish a routine for the children in order to make them accountable for covering each area.

The classroom was arranged for easy movement among the areas. To introduce the learning areas to the children, the teacher read "Signs of Spring" (56) and then proceeded to draw the children's attention to the signs of spring within the room.

Time was allowed for discussion and the children learned that a certain behavior was expected in each area. Four children were selected to demonstrate the procedure in each area and daily lessons were based on each area's content. (Refer to Charts 1, 2, and 3, pp. [illegible]0 and 21.)

Routine for Interest Areas

A basic routine was established by which the children could naturally handle the disruptions of known classroom procedures, and also to enable them to handle this new freedom of independent learning. The basic routine was as follows:

After a child completed his seat work and had it checked he voluntarily selected an interest area. The interest corners (see Appendix A) contained Signs of Spring, individual activity sheets with instructions, and materials--paper, clay, paints, etc.

The pupil selected the specific area where he picked the activity sheet, read the instructions, and performed the suggested activity with the required materials.

The completed activity was placed with a straight pin on the bulletin board labeled "Signs of Spring." The pupil then had to clean up and put away all materials.

The foregoing procedure may have involved no more than three children in the same area.

The "Signs of Spring" displayed on the bulletin board indicated which children had completed the interest area. Teachers then checked the sign-up sheet to see if the proper procedure had been followed.

The opportunities the interest areas allowed the children were to gain stability of moving smoothly into a new form of learning and to establish a routine for future centers. These interest areas took approximately six teaching days.

Motivation for Scientific Study

A film was secured titled "A New World is Born." This film helped us to provide a background for the development of the new unit. It preceded the week's lesson on the Season Cycle Wheel (see Appendix F). Through the content of this film, a vocabulary was introduced and its use was encouraged.

The foundation of the ecology unit and movement into the independent work involved in the learning centers was then established.

It was also necessary to correlate the new unit with the concepts to be taught in the Philadelphia Elementary Science Primary Unit. (See Charts 1, 2, and 3, pp. 20-21.)

Pupil-Teacher Organization

A pupil-teacher system was organized by assigning learning partners to establish a conducive atmosphere for working together. After evaluating the reading achievement of the first and third grade children during the school term, the children who learned faster were assigned to the children with a lower degree of achievement in reading.

The task of the pupil-teachers was to help the pupils in all areas of learning (teacher demonstration and learning center activities).

During the teacher demonstrations the pupil-teachers were to make sure all the work of their pupils was complete and that they performed all the specified activities.

During the learning centers the pupil-teachers were to aid their pupils in reading stories, vocabulary, concepts, puzzles, projects, tests, work sheets, diagramming, cleaning up, and movement between centers.

At all times pupil-teachers were to aid their pupils in increasing their attention span and improving behavior .

On learning-center days the pupil-teacher was responsible to keep his pupils involved and to work with the other two pupil-teachers in his center in order to keep the group cohesive and moving. The centers were separated by room dividers, supply trucks, and easels providing ample space for a walkway.

The three individual groups worked together as a whole on vocabulary, concept, and project proceedings. In each of these areas the pupil-teachers took turns guiding the lesson. The three groups worked individually on reading stories, puzzles, making the project, and testing. In order to keep things in their proper centers, the puzzles and stories were color coded.

At the end of each center, progress was recorded (see Appendix I).

Teaching Time Schedule

Because of elements involved in the Learning Centers and their correlation to other subject matter (see Charts 1, 2, and 3, pp. 20-21), the teachers arranged the program so that Learning Centers were in use from 1:15 to 2:45 on Monday, Wednesday and Friday. Each group would spend two days in a center.

At the end of each center the rosters were checked and the center number was crossed out. It was then established which center the children were to go to next.

Teacher demonstration lessons were Tuesday and Thursday, utilizing the same time schedule as shown on page 32.

Content of Learning Centers

The contents of the learning centers were all teacher made. Charts were printed with magic markers on experience chart paper. Reading stories were taken from old science books, covered with construction paper and fasteners. Puzzles were taken from old science books and magazines pasted on cardboard cut into approximately twelve pieces and put in envelopes. Project procedures were printed on colorful posterboard.

Each area was decorated with appropriate pictures from old science books, magazines, science concept charts, and completed projects.

For the projects, those supplies not readily available in the school were purchased, borrowed, or brought in by the teachers or children.

The learning centers used the following time schedule and procedures.

Time Schedule

FIRST DAY

1:15-1:30 p.m.	Vocabulary
1:30-1:50 p.m.	Reading stories
1:50-2:05 p.m.	Picture puzzles
2:05-2:20 p.m.	Concepts
2:20-2:35 p.m.	Project procedure
2:35-2:45 p.m.	Setting up for project

SECOND DAY

1:15-1:25 p.m.	Vocabulary review
1:25-1:35 p.m.	Concept review
1:35-1:45 p.m.	Project procedure review
1:45-2:30 p.m.	Making of project and cleaning up
2:30-2:45 p.m.	Testing

Lesson Plans and Procedures

LEARNING CENTER 1

Animals--Red

1. Vocabulary Chart

migrate
hibernate
hatch
warmth
protect
insects
cacoons
fish
scales
gills
change
develop
cold-blooded
wings
warm-blooded
reptile
feathers
scaly
eggs

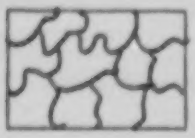
2. Reading Stories

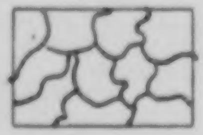
How animals help us

Different kinds of animals

Animal habitats

3. Puzzles





4. Concept Chart

   a. Living things are either plants or animals.

   b. Plants and animals differ greatly in size and shape.

   c. All living things need food, water, and with few exceptions, air.

   d. All living things reproduce.

   e. Food provides the energy man uses in moving.

   f. There are many different kinds of animals:

      Mammals
      Fish
      Amphibians
         Reptiles
         Birds
         Insects

5. Project Directions

   a. Look at the two natural habitats.

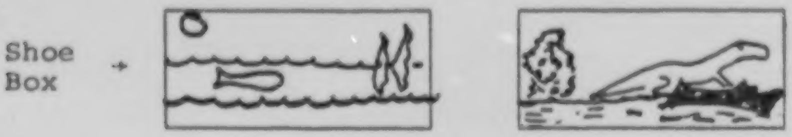
   b. Pick one you would like to make.

   c. Write your name on a card.

   d. Make your natural habitat: diarama.

      Could you live there:

6. Project Diagram



7. Test (shown on next page).

8. Supplies

   a. An aquarium with twenty-four gold fish and three snails.

   b. Daily fish food and week-end feeder.

   c. An aquarium with two hermit tree crabs and an iguana.

   d. Hermit tree crab food.

   e. Meal worms.

   f. Lettuce.

   g. Show boxes.

   h. Different colored construction paper.

   i. Crayons.

   j. Pencils.

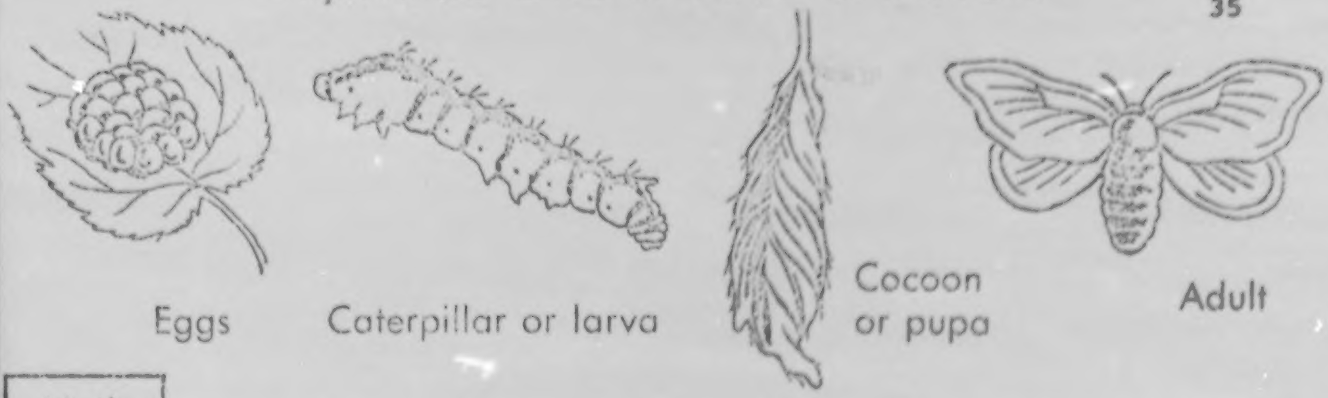
   k. Scissors.

   l. Rubber cement.

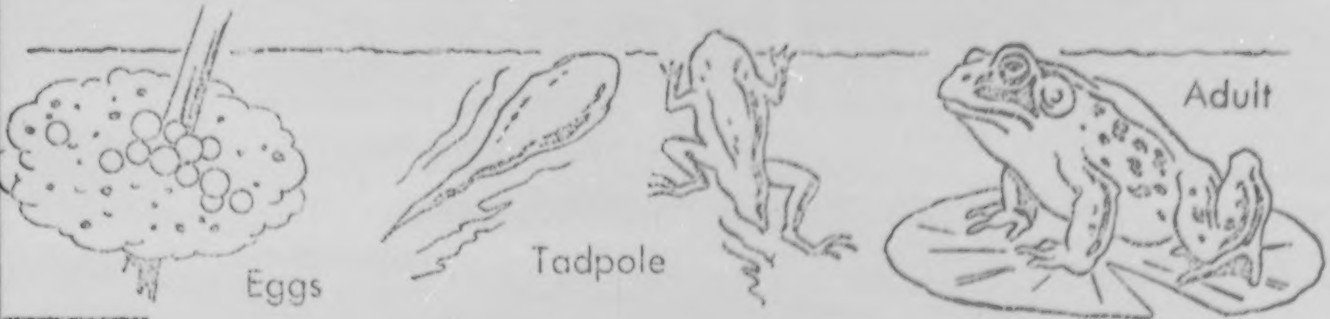
   m. Rulers

   n. 3 x 5" index cards.

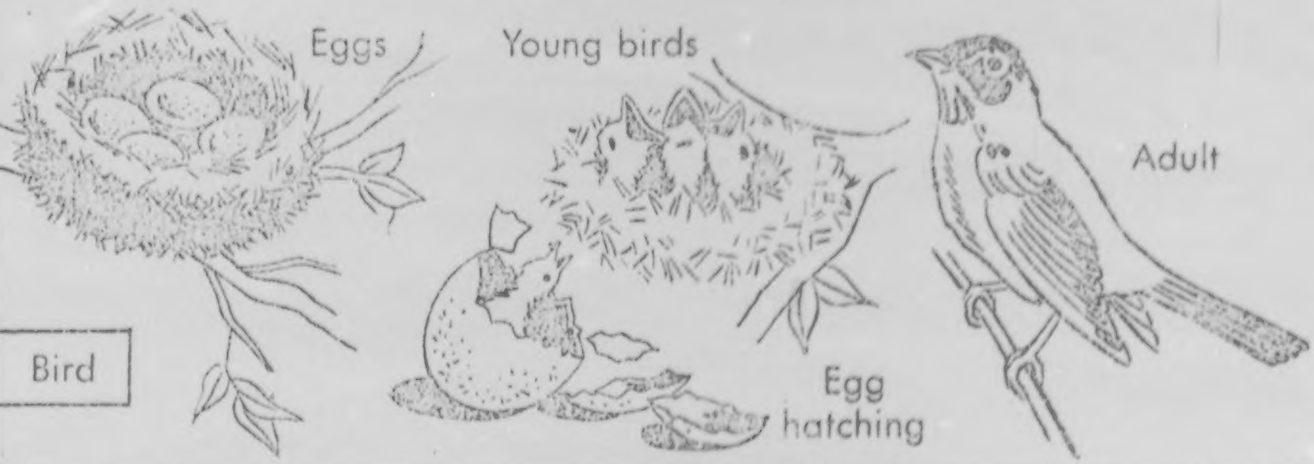
ANIMALS GROW AND CHANGE


Eggs
Caterpillar or larva
Cocoon or pupa
Adult

Moth


Eggs
Tadpole
Adult

Frog


Eggs
Young birds
Adult
Egg hatching

Bird

PUPIL ACTIVITIES

1. Circle the name of the animal that lays its eggs in water.
2. As frogs grow they change from eggs to ______________ to adults.
3. Another name for the caterpillar is ______________.
4. Color the adult animals.

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o. Scotch tape.

p. Two water buckets.

q. Newspaper.

LEARNING CENTER 2

Sky and Water--Blue

1. Vocabulary Chart

    North Star
    sun
    heat
    light
    clear
    day
    night
    star
    shadows
    shapes
    constellations
    water vapor
    moon

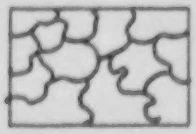
2. Reading Stories

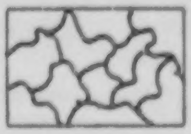
    The Sky and You

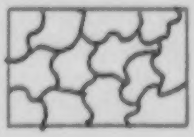
    Day and Night

    How We Use Water

3. Puzzles







4. Concept Chart

    a. Stars are trillions of miles away from the earth.

    b. The sun is a star.

    c. The earth rotates on its axis once every twenty-four hours; this rotation causes day and night.

    d. The sun is the primary source of energy for the earth and the other planets.

e. The moon is the earth's only natural satellite.

f. The moon revolves around the earth about once a month.

g. People, planets, and animals must have water.

h. Water has three forms: ice, water, and water vapor.

5. Project Directions

   a. Cut out the four boxes on your paper.

   b. Get four black squares.

   c. Place one white square over one black square.

   d. Take a pin and punch a hole in all of the dots.

   e. Do all four squares the same way.

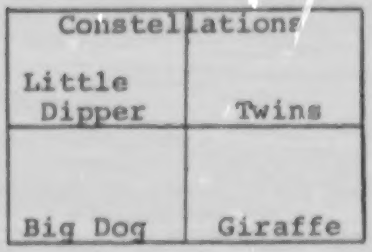
   f. Paste your white square in your ecology notebook and label them.

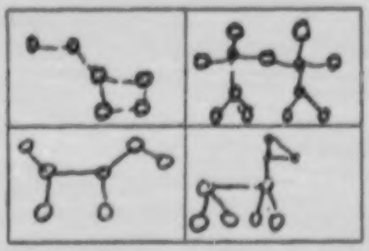
   g. Take one frame and put one black square in it.

   h. Hold it up to the light. What do you see?

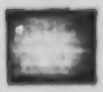
6. Project Diagram

   Demonstration

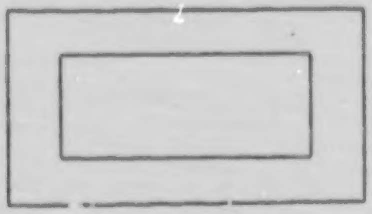




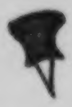
← Squares to be cut out



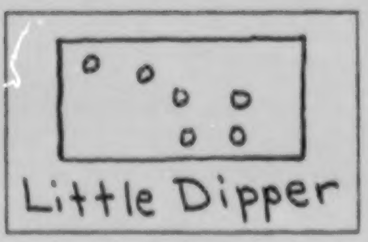
← Black Square



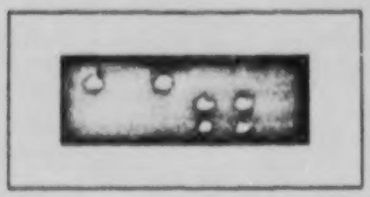
← Frame made from 3" x 5" cards



← Pin to punch hole


Little Dipper

← Paste and label cut out white squares



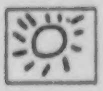
← Black paper inside the frame

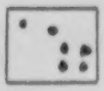
7. Test

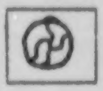
Match pictures with words.

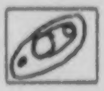
Find the right word

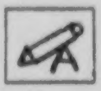
Sun	Little Dipper	Earth
Planet	Telescope	Star
Moon	Water	Ice

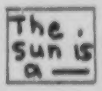


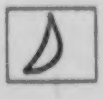


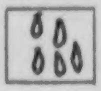


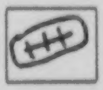












8. Supplies
    a. Pencils.
    b. Scissors.
    c. Ecology notebook.
    d. Black construction squares, teacher made.
    e. Constellation sheet.
    f. Rubber cement.
    g. Frames.
    h. Waste paper basket.
    i. Bulletin board.
    j. Straight pins.
    k. Small white envelopes.
    l. A telescope with a constellation attached for an example.

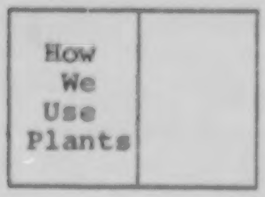
LEARNING CENTER 3

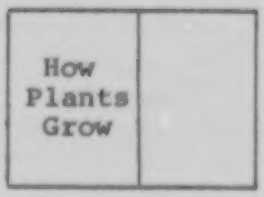
Plants--Green

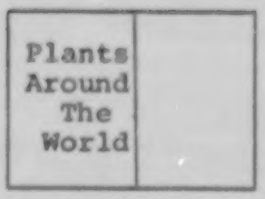
1. Vocabulary Chart

plant
cup
high
flower
leaves
grow
foot
inches
seed
stem
roots
leaf
yellow
green
brown
soil
spring
trees
blossom
sunlight
minerals

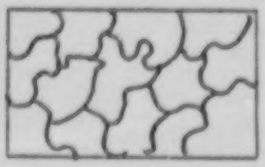
2. Reading Stories

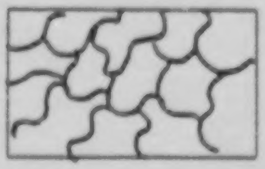

How
We
Use
Plants

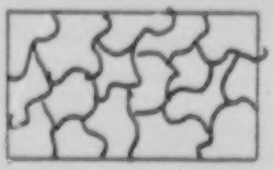

How
Plants
Grow


Plants
Around
The
World

3. Puzzles







4. Concept Chart
   a. Plants are living things.
   b. Different types of plants grow in different environments.
   c. Green plants use energy of sunlight in making their own food.
   d. Man uses plants for many purposes.
5. Project Directions
   a. Pick a flower pot.
   b. Fill it half full of soil.
   c. Make four little holes with your finger.
   d. Pick four different seeds; place them in the holes.
   e. Cover up the seeds.
   f. Water your plant.
   g. Place it on top of the gray cabinet in a tin. What do you think will happen?

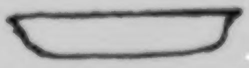
6. Project Diagram

Soil

Seeds

Watering Can

Flower Pot



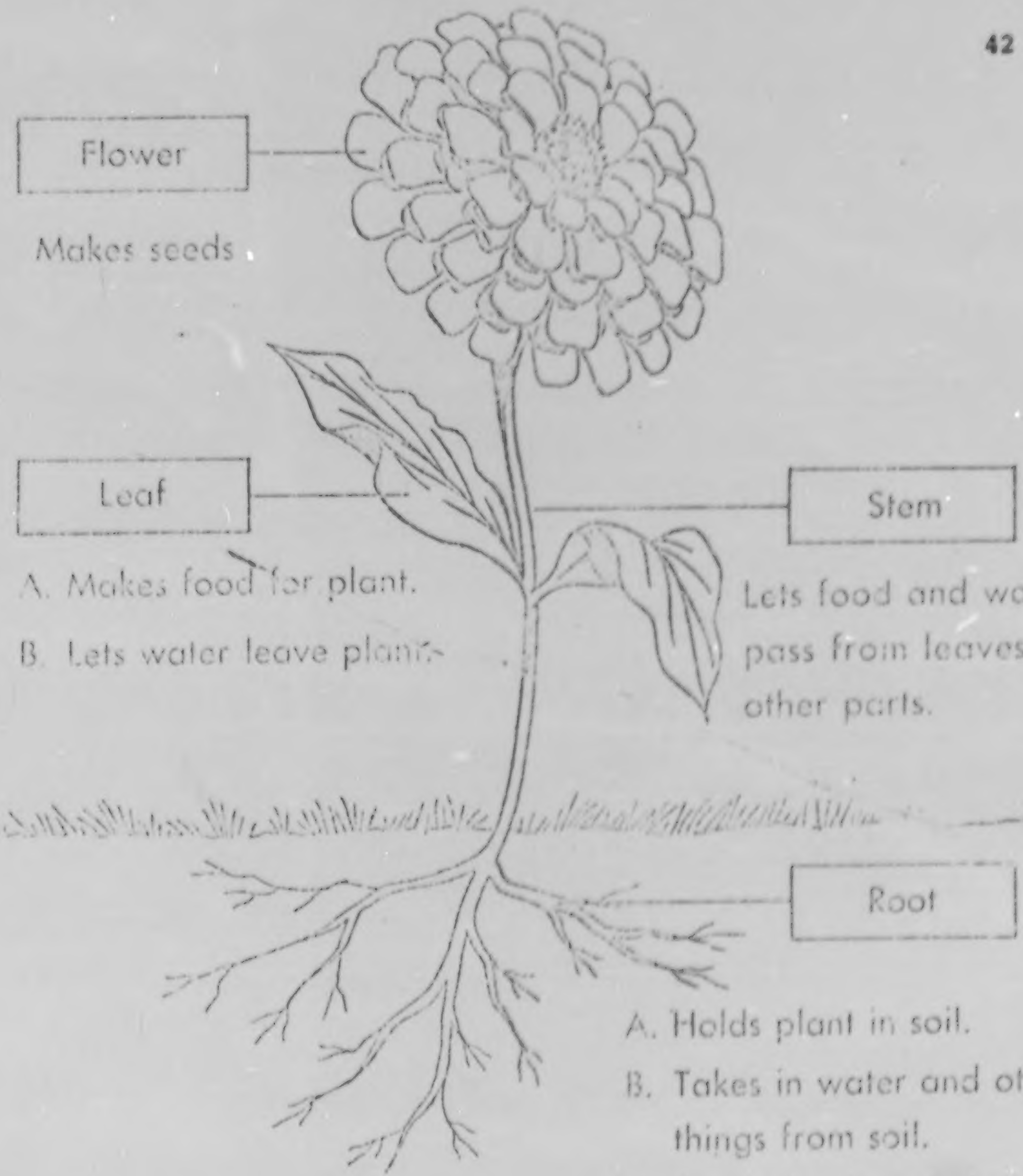
Tin to put pot into

7. Test (shown on next page).

8. Supplies

    a. A flower pot.
    b. Seeds: lima bean, radishes, aster, geranium.
    c. Two or three watering cans.
    d. Tin plates.
    e. Soil.
    f. Scooper.
    g. Pencils.
    h. Crayons.
    i. Decoration plants: fern, geranium, philadendron.
    j. Stems forming roots.
    k. Sweet potato growing roots.
    l. Newspaper.
    m. Paper towels.
    n. Bucket of water.

PARTS OF PLANTS



Makes seeds.

A. Makes food for plant.

B. Lets water leave plant.

Lets food and water pass from leaves to other parts.

A. Holds plant in soil.

B. Takes in water and other things from soil.

C. Stores food made by leaves.

PUPIL ACTIVITIES

1. Circle the part of a plant that is under ground.
2. Draw a line under the part of a plant that lets air enter and leave the plant.
3. The part of the plant that makes seeds is called the ______________
4. Color each part of the plant a different color.

Copyright [illegible]

o. Waste basket.

p. Sponges.

LEARNING CENTER 4

Earth's Crust--Brown

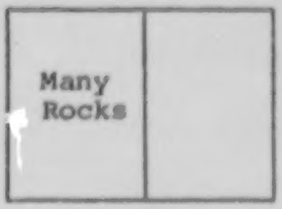
1. Vocabulary Chart

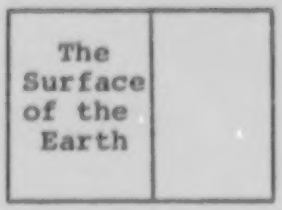
land
earth
firm
loose
surface
ground
brown
top soil
mineral salt

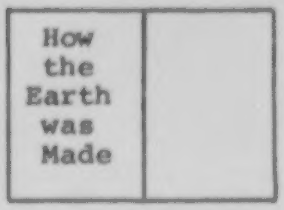
dissolved
clay
air
sand
gravity
dissolved
stems
green

food
blade
harrow
rocks
worms
decayed
matter
grow

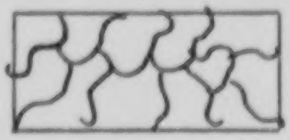
2. Reading Stories

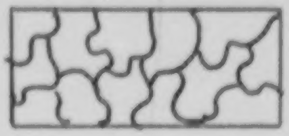



The Surface of the Earth


How the Earth was Made

3. Puzzles





4. Concept Chart

a. The earth is very old.

b. The surface of the earth is different in different places.

c. Many things change the earth's surface; among these things are wind, water, living things and temperature changes.

d. Many agents--including air, water, living things and temperature changes--are constantly changing rocks into soil.

e. Soil is made of clay, sand, and decomposed products of plant and animal life.

f. The atmosphere is the air, or gas portion (part) of the earth.

5. Project Directions

   a. Put one handful of pebbles in your jar.

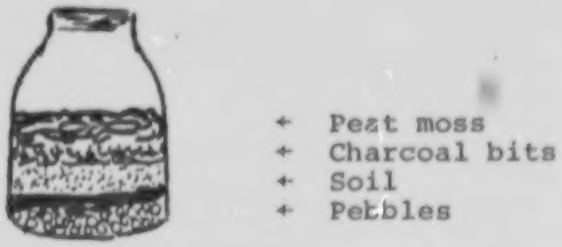
   b. put two handfulls of soil in your jar.

   c. Put one handful of sand in your jar.

   d. Sprinkle one handful of charcoal bits on top of the sand.

   e. Put one handful of peat moss on top of the sand. Can you see the layers?

6. Project Description



7. Test

Teacher administered--questions were written on experience paper--answers were in the concept charts.

a. The atmosphere is made up of _____ and _____ _____.

b. Plants grow in _____.

c. Rocks are made into soil by _____, _____, _____, _____, and _____.

d. Soil is made of _____ _____ and _____ _____.

e. Name three things about the earth: _____, _____, and _____.

8. Supplies

a. Demonstration terrarium with small plants was on display in this center--globe.

b. Rocks and shells were on display.

c. Jars.

d. Soil.

e. Pebbles.

f. Peat moss.

g. Sand.

h. Charcoal bits.

i. Scoops.

j. Filmstrip projector.

k. Filmstrip "Desert Rocks and Minerals."

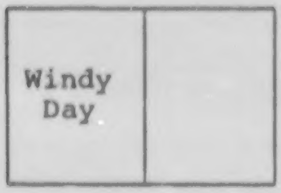
LEARNING CENTER 5

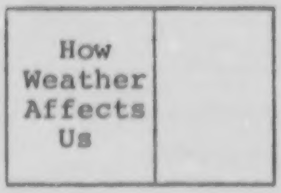
Weather and Air--Yellow

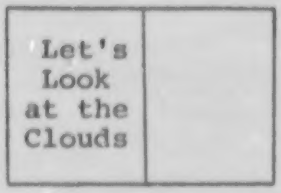
1. Vocabulary Chart

season
winter
spring
summer
fall
autumn
wind
clouds
snow
rain
affects

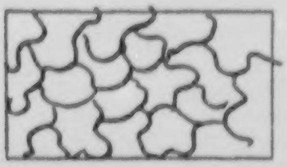
2. Reading Stories

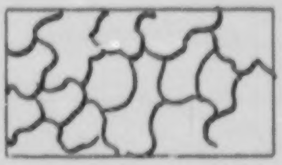


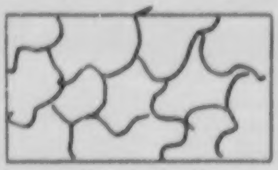

How
Weather
Affects
Us


Let's
Look
at the
Clouds

3. Puzzles







4. Concept Chart
   a. Weather affects everyone.
   b. Weather is a condition of the air.
   c. Wind is moving air.
   d. There are various kinds of clouds.
   e. Rain and snow come from clouds.
   f. The changing seasons affect living things.
5. Project Directions
   a. Take a plastic bag and a balloon.
   b. Fill them up.
   c. Be sure to close the ends.
   d. Set the bag and the balloon on the table.
   e. Answer the questions on the test. What do you find?
6. Project Diagram

Plastic bag → ← Balloon

7. Test

   a. Inside your bag and balloon is
      air
      salt
      soil
      sun

   b. Does air have color?
      yes
      no

   c. What is moving air called?
      water
      wind
      food
      plants

   d. Does air have weight?
      yes
      no

   e. Is all air clean?
      yes
      no

   f. Does air have shape?
      yes
      no

8. Supplies

   a. Balloons.

   b. Plastic bag.

   c. Fasteners.

   d. Pencils.

   e. Answer sheet.

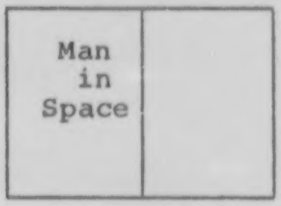
LEARNING CENTER 6

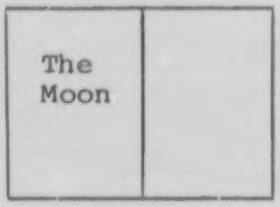
Space--Black

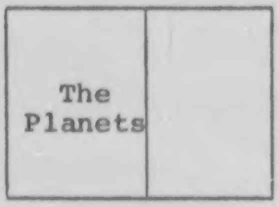
1. Vocabulary Chart

   planets
   rockets
   satellite
   engine
   space
   travel
   surrounds
   outer
   layer
   craters
   moon
   gravity

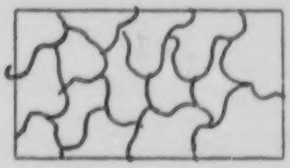
2. Reading Stories

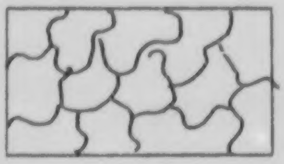


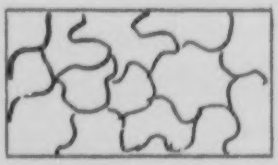




3. Puzzles

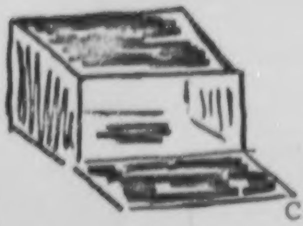






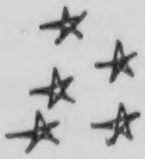
4. Concept Chart
    a. A layer of air surrounds the earth; beyond this layer is outer space.
    b. The sun is the central body in the solar system.
    c. The earth is a planet in the solar system.
    d. The time it takes for the earth to orbit the sun is once a year.
    e. Gravity holds objects on the earth.
    f. Gravity holds the atmosphere around the earth.
5. Project Directions
    a. Paint your cardboard black.
    b. Let it dry.
    c. Paste the earth in space.
    d. Paste the stars in space.
    e. Paste the craters on the surface of the moon. How would you get there?

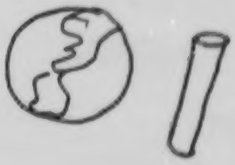
6. Project Description



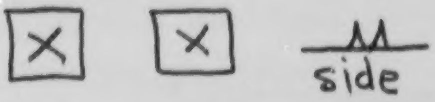
Cardboard box
painted black

Paper
stars





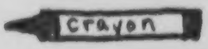
Blue circle for
the earth with
orange chalk shading



Green squares for craters

7. Test

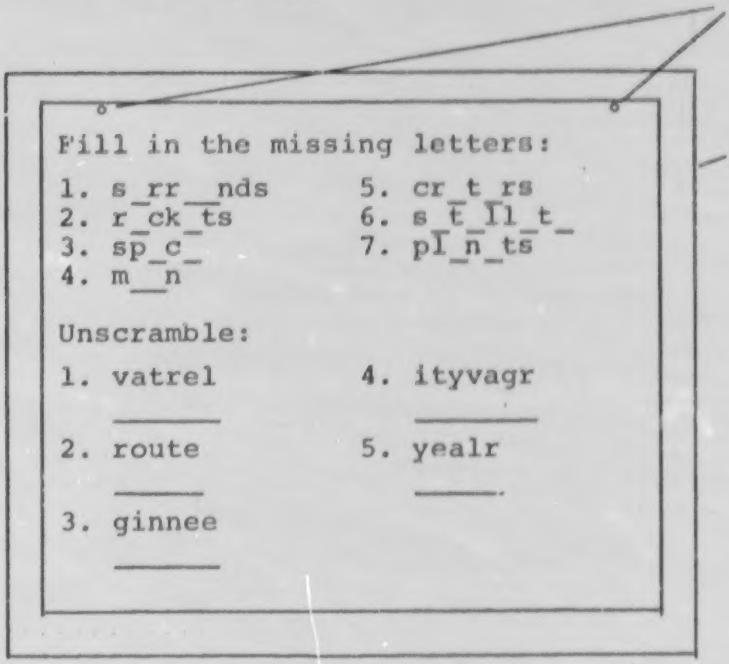
Magic Slate--based on the vocabulary chart.



Black crayon

Cloth to erase answer

Paper fasteners



Fill in the missing letters:

1. s_rr__nds
2. r_ck_ts
3. sp_c_
4. m__n
5. cr_t_rs
6. s_t_ll_t_
7. pl_n_ts

Unscramble:

1. vatrel ______
2. route ______
3. ginnee ______
4. ityvagr ______
5. yealr ______

Plastic
covered
cardboard

8. Supplies
   - a. An example of the finished view of earth from the moon.
   - b. Cardboard box 13" x 6" x 9".
   - c. Black paint.
   - d. Brushes.
   - e. Blue circles.
   - f. Green squares cut like craters.
   - g. Rubber cement.
   - h. Paper stars.
   - i. Orange chalk--Binney Smith Brand.
   - j. Large Astronaut and rocket poster was displayed on a mobile.
   - k. Newspaper.
   - l. Paper towels.
   - m. Two water buckets.
   - n. Paint cloths.
   - o. Waste paper basket.
   - p. Paint shirts.

Supplementary Work for Learning Centers

To keep the children involved in learning activities after the completion of testing, if time allowed, the following were available to them: activity sheets on plants and animals due to the numerous amount of concepts needed to be covered in these areas (see Appendix C) and materials from the library. In each area books, picture books, filmstrips, pictures, and dictionaries were available (30). Word puzzles were available from teacher demonstration lessons (see Appendix S).

CHAPTER IV

CORRELATION OF SUBJECT MATTER

This science unit held many adventures for the people involved. It produced an area of learning which encompassed for them more elements and subjects than could have been handled in the ten-week period. Therefore, it attempted to show the varied range of materials and subjects which were and could have been incorporated.

Language Arts

Phonics

1. Putting vocabulary into alphabetical order.
2. Dividing vocabulary into syllables.
3. Using vocabulary and finding synonyms, antonyms, and homonyms.
4. Classifying vocabulary according to initial and final consonants.

Reading

1. All vocabulary and definitions.
2. All stories in centers and teacher demonstrations.
3. Directions for activities.
4. Experience stories.
5. Science books.

6. Some of the puzzles.
7. Library books.
8. Concepts.
9. Stories from reading series in school dealing with animals, plants, sky, water, earth's crust, and air.
    a. Bank Street Reader, Book 2', More About Green Light Go (New York: Macmillan Company, 1966).
    b. Sullivan, Books 5-16.
    c. Lippincott, J. B. Basic Reader, Book 1'-2'.

Handwriting

1. Note taking.
2. Letter writing--invitational letters, thank you notes, business letters.
3. Addressing envelopes.
4. Homework containing ecology information.
5. Paragraph writing.

English

1. Recognizing sentences.
2. Making reports.
3. Using punctuation.
4. Using capital letters.
5. Outlining.
6. Doing activity sheets.

Spelling

1. Vocabulary words.
2. Activity sheets.
3. Projects in centers.

Literature

1. Library books.
2. Poetry.
3. Creative Dramatics.

Dictionary Usage

1. Looking up vocabulary words and finding their meaning.
2. Looking up synonyms, antonyms, and homonyms.

Math

1. Linear measuring of ecology flags to put in notebooks.
2. Concepts in directions: over-under, left-right, larger-smaller, before-after, in between, into-out of.
3. Sequencing of centers, ordinal numbers, first, second, third, etc.
4. Following directions of measurement in Earth's Crust Center, measuring growth of plants and charting .
5. Calendar skills for checking growth of plants.
6. Charting progress in learning centers.
7. Cover math units--fractions, geometry, measurement, addition and subtraction, word problems--to prepare for all lessons.

Health

1. Entire concept of pollution and what effect it has on the body.
2. Waste process of the food chain and nitrogen cycle.
3. The need for energy gained for the body through food--learned through a unit on foods and the food-chain cycle.
4. Water and its many uses, in particular, cleanliness.
5. Lesson on Oxygen Mask, invented by Garrett Morgan, a Black Man, to be used where air is polluted heavily.
6. Safety--scissors, walking, safety, in passing materials and supplies like pins.
7. Fire prevention was stressed.
8. The health book used in the third grade, Health and Growth, by Richmond (68), to teach the following units in relation to the project:
    a. What Do You Know About Your Body?
    b. How Can You Prevent Accidents?
    c. How Can You Move?
    d. What Foods Should You Eat?
    e. What Are Microbes?
    f. How Does A Community Work For Health?

Social Studies

1. Entire pupil-teacher concept fosters inter-action among the children.

2. Pollution is a concern of man, affecting the entire community.
3. Unit on Foods, where they are from--farm, country.
4. Conservation.
5. Map study--bodies of water and land masses, and where they are located.
6. Black History--Garrett Morgan, invention of oxygen mask.
7. Units of study from Communities at Home and Abroad (22).
    a. Where Do We Live?
    b. Learning About A Community.
    c. The Areas in a Community.
    d. Cultural and Physical Aspects.
    e. Different Environments.

Physical Education

1. Dance.
2. Relief exercises.

Music

1. Popular music involving geographic terms, such as "On a Clear Day," "What the World Needs Now," and "Starshine". "Starshine" is from the show Hair.
2. "William Tell Overture" for lessons.
3. "What Makes the Weather."
4. "How Do Seeds or Plants Travel?"

5. "What Foods Should We Eat Everyday?"

Science

1. The entire unit is developed from science concepts.
2. Noise pollution.
3. Graffitti.

Art

1. Drawings of illustrations concerned with lessons.
2. Mobiles by children.
3. Bulletin boards by children.
4. Illustrating ecology flag.
5. Diaramas.
6. Cutting and pasting nitrogen cycle.
7. Coloring in tests.
8. Water colors on thank-you notes.

CHAPTER V

CULMINATION OF THE PRIMARY SCIENCE UNIT

During the developing weeks of the unit, the school staff and children were invited to view teacher demonstration lessons via sign-up sheets (see Appendix W). Therefore, by the time of the culmination of the unit, the teachers felt that a sign-up sheet in the office was still the best way to handle the situation. Teachers were advised of date, time, and sign-up sheet at a faculty meeting.

The culminating activity took place within the learning centers (see Appendix J). Six children were assigned to explain the function of each center and the reasoning behind the decorations--mobiles, word puzzles, etc.--utilized within each.

The classes attending were seated within the assigned centers as they were grouped and rostered before their arrival.

The entire class greeted visitors with a song they had learned during the unit's evolvement, "What Makes the Weather" (133). Visitors were then taken through a mini-center lesson using first-day procedure.

When the time arrived to construct the project, one pupil-teacher from each group and his or her pupils demonstrated the completed projects from each center.

They then passed out the remaining tests from each area and allowed time for visitors to complete the assigned test.

To conclude the program three pupils were chosen to speak to the group on the following subjects.

1. A definition of ecology.
2. An explanation of a natural cycle.
3. An explanation of how this natural cycle has been disrupted.

Following this the entire group recited "Man's Carelessness" a poem by James Kelly of Philadelphia. (In Appendix S.)

PART II

PRIMARY ECOLOGY UNIT

CHAPTER VI

INTRODUCTION

Purpose

The structure of the following unit in its entirety was constructed so that the materials herein could be readily adapted for grade levels one through four; this structure was so flexible that each cycle could be taught as a separate unit.

The content of this ecology unit was based on the following widely accepted principles of ecology:

1. Life patterns reflect the patterns of the physical environment.
2. Plants and animals of a given area tend to group themselves into loosely organized units known as communities.
3. An orderly predictable sequence of development takes place in any area equaling ecological succession.
4. A community and its environment (the living and the non-living) constitute an ecological system,or ecosystem (11, pp. 48-50).

Environment

This unit of study was formulated in an elementary school in a deprived area of north Philadelphia. The surroundings held a number of polluted areas, however, with good potential upon which to develop community awareness within the children.

Two teachers were involved: one teacher was female and black with a Master of Arts degree in Reading, plus thirty credits in Urban Education, and over fourteen years of classroom experience; the other teacher was female and white, with a Bachelor of Arts degree in Elementary Education, plus twenty-four credits, also in Elementary Education, and less than four years of classroom experience.

In the morning the first grade was taught by Elaine Carty and the third grade by Jeanette Quinn. In the afternoon the two joined for team teaching using two distinctly different methods of instruction--structured learning centers and traditional teacher-directed classroom work. Three cycles were chosen for instruction.

Water cycle. This was the most familiar cycle to the children, all of its aspects being in their environment. This represented the physical science aspect of the unit.

Food-Chain cycle. This cycle was basic to the children's environment, yet extended them into environments less familiar to them. This was the biological science aspect of the unit.

Nitrogen cycle. This cycle was the least familiar to the children, yet it encompassed all the things previously taught in the other cycles--air soil, water, and organisms. It acted as the chemical science aspect of the unit.

Overall Concepts

1. To make children aware of each one's importance in their environment.
2. To develop within the children the ability to interpret their environment through the understanding and use of scientific concepts.
3. To show children that all energy comes from the sun without which no cycle would exist.
4. To make children aware that there are natural cycles as well as disrupted cycles in ecology.
5. To produce three natural cycles for the children--water cycle, food-chain cycle, and nitrogen cycle--including the elements of pollution within these three cycles at the primary level.
6. To make children aware of the correlation between the

water cycle, food-chain cycle, and nitrogen cycle without which they could not exist.

7. To expect that these children adjudged to be "slow learners" by the system can and will deal with the presented materials.

Behavioral Objectives

1. To have children recite, match, read, and write ecology vocabulary words and definitions.
2. To have children manipulate vocabulary words through the use of mobiles, puzzles, flash cards, and games.
3. To have children be able to identify and correctly label the three natural cycles.
4. To have children perform experiments with plants and water to gain tactile experience using the scientific methods.
5. To have children develop experience stories based on films, pictures, stories, teacher demonstrations, and discussion.
6. To have children classify natural cycles and disrupted cycles.
7. To have children illustrate a disrupted cycle.
8. To have children recite poems on pollution.
9. To have children take out library books on ecology.
10. To have children take a written test at the end of each cycle.

11. To have children comment and question on films, filmstrips, pictures, and books presented to them which are related to ecology.
12. To have children state five ways in which they can improve their environment.
13. To state three ways in which everyone contributes to pollution.
14. To have children sing songs related to the unit.
15. To have children bring in newsclippings about ecology.
16. To have children write letters of invitation and thank-you notes to visitors and resource people.
17. To have children make projects on their own at home or after school.
18. To have children listen to a lecture on protecting their environment.
19. To take children on neighborhood walks and have them point out different pollutants.

CHAPTER VII

INITIATING LESSONS TO ECOLOGY UNIT

Preface to the Lessons

Due to the age of the children and their lack of scientific background, a cycle approach to the teaching of ecology was chosen.

The cycles chosen, it was decided, would best establish this needed background. Having given the children this background, the more sophisticated science units could be taught.

Aims

1. To establish a functional ecology vocabulary upon which to base ecological learnings.
2. To have children function with the ecology vocabulary in order to show children its relationship to themselves in their environment.
3. To establish routine and atmosphere for learning about ecology.
4. To have children learn to work together with another class.

5. To begin the study of ecology on a familiar level to prepare children for more unfamiliar learnings.

Facts and Understandings About Ecology

The branch of science that deals with how living things, including man, are related to their surroundings is called ecology. As a formal science it is already about seventy years old, yet until recently its importance was not widely recognized. Had ecological principles, which stress the delicate balance of nature, won general acceptance earlier, many present-day environmental problems might have been avoided (11, p. 441).

Ecology emphasizes the dependence of every form of life on other living things and on the natural resources in its environment, such as air, soil, and water (11, p. 46).

Belatedly, man has become aware that every living thing, himself included, affects every other living thing in an intricate interaction with the land, air, and water. With this in mind, the following vocabulary was developed and taught to the children as a foundation in ecology (29, p. 9).

Definitions of the Overall Ecology Vocabulary

1. Balance--to keep equal.
2. Community--the plant and animal population of a special area.
3. Consumer--a person or thing that uses up the things in the environment.
4. Cycle--things that happen over and over again.
5. Decomposer--an organism that breaks things down.
6. Ecologist--one who studies ecology.
7. Ecology--the study of natural cycles within an environment and disrupted cycles within that same environment.
8. Ecosystem--the special way a community works in its environment.
9. Energy--power.
10. Environment--all the things within a community.
11. Niche--a special little part of a community.
12. Organism--any form of animal or plant life.
13. Physical factors--those things naturally made.
14. Pollution--to make dirty.
15. Population--the total number of organisms in a community.
16. Producer--an organism that makes things.

Lesson Plans

A week of lessons were prepared in order to initiate the vocabulary for the Ecology Unit. They were presented for one hour each afternoon.

MONDAY

2:00-2:20 p.m. Seasons of the Year

The children were asked to observe a large season cycle (see Appendix P). Observations were listed on the board. They were asked what shape it was in. When something goes around and around like this, it is called a cycle. Can you name another cycle?

The component parts of the season cycle were reviewed: Which months make up a season? How many seasons, how many months? Which seasons precede and follow each other?

All this information was familiar to the children.

The children were then told that each part of the cycle has its own special place which is called a niche. Can you name a niche of this season cycle?

2:20-2:45 p.m. Art

In order to reinforce the idea of the cycle the children were given materials with which they could make their own individual season cycle in miniature. The children had to cut out the two circles, place the smaller circle on top and join them with a fastener.

TUESDAY

2:00-2:10 p.m. Review

The words cycle and niche were reviewed in relation to the season cycle. The definition of ecology was introduced and reinforced. The children were told that today they were going to look at an environment, or set of surroundings.

2:10-2:35 p.m. English

The group of children was divided in half, both halves containing first and third graders. One half observed a farm environment. The other half observed a city environment. The setting was informal, chairs were in a horse-shoe fashion around the picture.

Teacher:

This is a community. When you talk about plants and animals living together you are talking about a community in its surroundings or environment.

What is the environment or surroundings of this community. Name some physical or natural factors. Name some man-made or cultural factors of this community. There are many organisms, or plants and animals in this community. Can you name one?

The total number of organisms in a community is called the population. What is the population of this community? The way the organisms live and work together in their community is called an ecosystem.

Can you name an ecosystem in this community? How do they work together? Where do they get their energy? From the sun.

2:35-2:45 p.m. Vocabulary

Re-assemble into one group. Use flash cards to review vocabulary just learned.

WEDNESDAY

2:00-2:10 p.m. Review

Word cards are randomly passed to the children. Teacher reads the definition and child with the word stands.

2:10-2:30 p.m. English

Children are again divided into the same groups. The environments are switched between the groups. Now that the children are somewhat familiar with the vocabulary the teacher can now use the words in the discussion. For example: Find the physical factors. Find the cultural factors. What are organisms? Find one. What is a community? What is the environment of this community? Who can find a niche? etc. The new words for this lesson are producer, consumer, and decomposer. The questions were: in a community there are organisms that make things called producers. Who would be a producer in this environment? In a community we also have organisms that use up what the producers make, called a consumer. Can you find one? When these things are used up they are decomposed. Can you see a decomposer? (Garbage men for example).

2:30-2:45 p.m. Vocabulary

Flash cards and definitions are used to review the ecology vocabulary with the entire class.

THURSDAY

2:00-2:10 p.m. Review

The definition of ecology is reviewed with the entire class. The children have been observing natural cycles. At this time the concept of disrupted cycles is introduced.

2:10-2:30 p.m. Science

Three pictures of polluted environments are displayed: one air pollution, one water pollution, and one earth pollution. Each picture is taken individually and discussed. For example: What is the environment like? What kind of a community is this? Name a niche. Name an organism, etc. What happened to this environment? It is polluted or dirty. Pollution is also a part of ecology, and a person who studies about ecology is called an ecologist.

2:30-2:45 p.m. Creative Dramatics

Choose two children for each picture. One child is to be an organism in the healthy environment and one child is to be an organism in the polluted environment. For example, if a child chose to be a bird for the air pollution picture he would fly happily in the healthy or clean environment and barely flap his wings or might even fall in the polluted environment.

FRIDAY

2:00-2:15 p.m. Review

The vocabulary was reviewed. The teacher flashed the words and the children responded in unison. The teacher then showed a definition card. A child raised his hand to read it. Another child raised his hand to give the corresponding meaning.

2:15-2:35 p.m. Contest

The boys were against the girls. Children were arranged in two straight lines of chairs facing each other. The teacher held up a definition for one child to read. The children took turns in order, alternating between boys and girls. After the child read the definition he was to respond with the correct word.

Score was kept--one point for each correct word. The limit was fifteen points.

The winning side received a small piece of candy. Subsequently contests were held at the end of the week to keep the ecology vocabulary functional for the children.

2:35-2:45 p.m. Conclusion

At this time the children were prepared for the natural cycles to follow, in particular, the water cycle which they were to meet first. They were told what the water cycle was and some things they might be learning about, for example, different types of clouds.

CHAPTER VIII

ECOLOGY CYCLES--NATURAL AND DISRUPTED

The Water Cycle

Snow that falls in the Antartic may stay for hundreds of years, but in most places snow melts and becomes liquid water. The water evaporates into water vapor. The water vapor condenses back into a liquid or solid. Around and around, the earth's water keeps changing its state. These changes of state are called the water cycle.

The Travels of Water

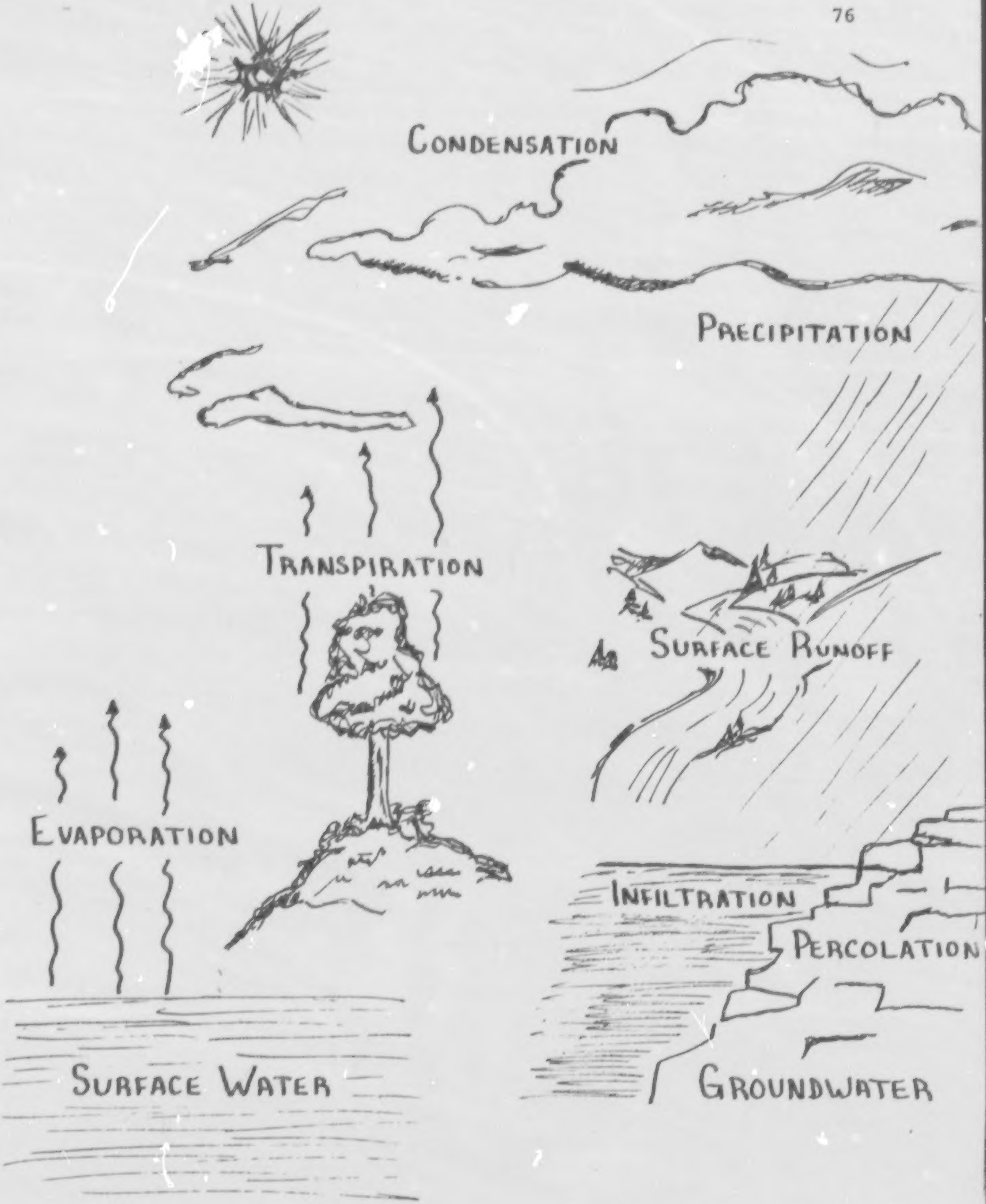
How many ways water travels up and down and around the world!

In the heat of the sun it rises into the air. The winds of the world carry it high up and far away. It cools and becomes clouds or fog or dew. It falls back to the earth as rain, sleet, hail, or snow.

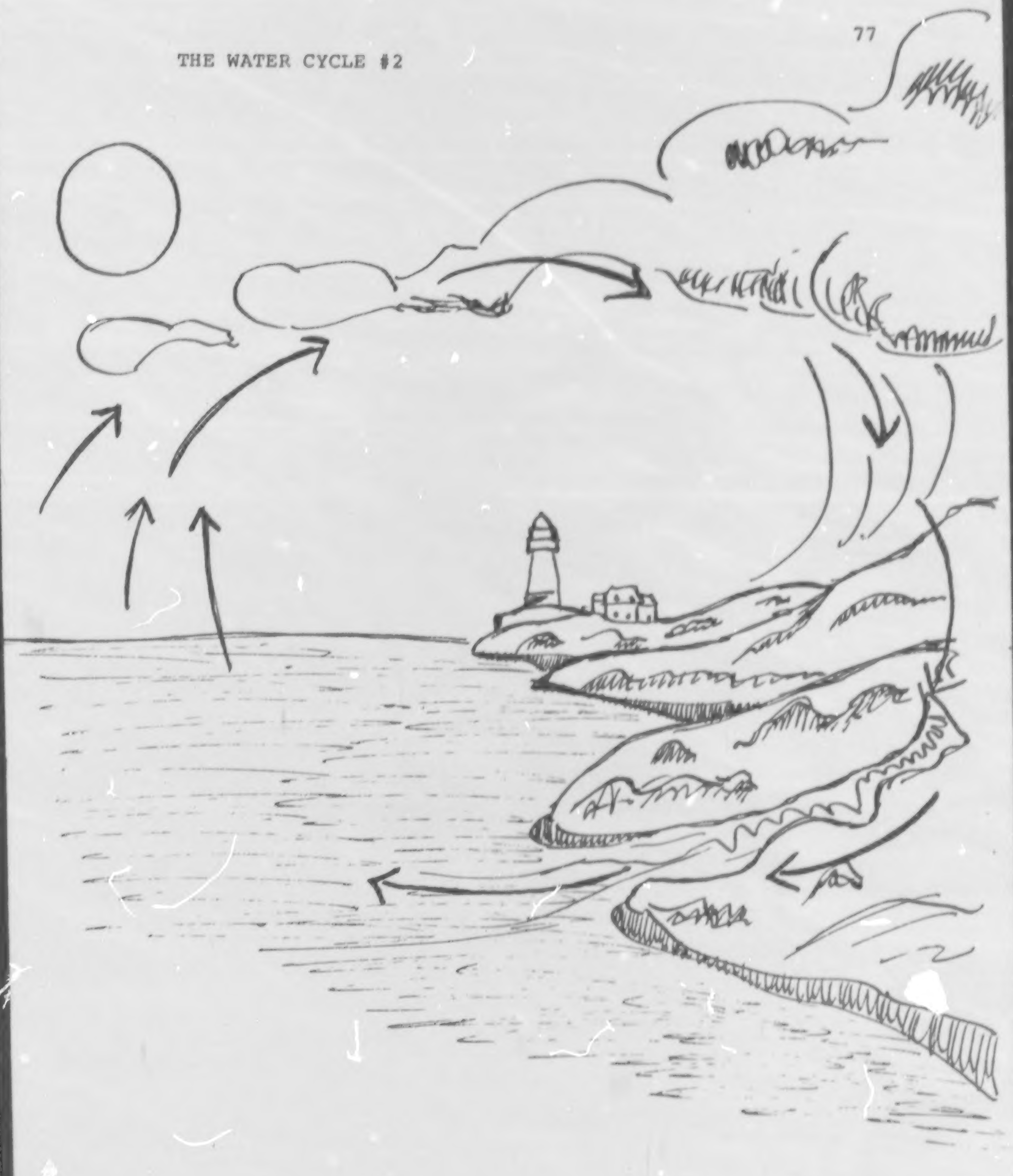
It fills lakes and oceans. It soaks into soil, where the roots of plants take it in. Animals drink it. People use it in many ways.

Up, down, and around the world, the travels of water are never over. The water cycle is endless.

THE WATER CYCLE #1


CONDENSATION
PRECIPITATION
TRANSPIRATION
SURFACE RUNOFF
EVAPORATION
INFILTRATION
PERCOLATION
SURFACE WATER
GROUNDWATER

THE WATER CYCLE #2



Facts and Understandings

There are facts about air which the children should know at the end of the water cycle.

Air is real. There is a blanket of air which covers the entire earth for a distance of at least one to two hundred miles. The air which envelops this earth also protects it; it is a good insulator and it holds heat to the earth. Heat and coolness, moisture and dryness on the earth depend on air.

Air is composed of several gases. The most important is oxygen. Nearly four-fifths of the air is nitrogen. Carbon dioxide is another gas in the air but only in a small amount. It helps green plants to grow and it is given off by all living things as they breathe. There is also water vapor in the air.

What would happen if there were no air? First of all, there would be no weather without air. The sky would be as dark as ink. The stars would shine by day as well as by night, like brilliant jewels in an inky background. The sun would rest like a silvery disc in the dark background. There would be no sound upon earth. The earth would be frigid cold at night and extremely hot by day. In a short time the whole earth would be devastated waste. (Refer to film "A New World is Born" by Walt Disney.)

It is a well known fact that there is no air around the moon.

As you continue your study of cycles, you will see why the sun, air, soil, and organisms are so very important in your lives. You will begin to see that each area mentioned has its own special niche in the universe and yet works and cycles with each other area to keep organisms alive.

Aims

1. To introduce words basic to the understanding of the Water Cycle.
2. To prepare them to focus on "Cycle" learning. (Food Chain Cycle Number 2 and Nitrogen Cycle Number 3.)
3. To introduce and stress needed concepts for basic understanding of the Water Cycle.
4. To touch on living and non-living aspects in the Water Cycle.
5. To demonstrate the importance of perpetuating natural cycles.
6. To help children see that "Learning" is all around.

Water Cycle Terms and Definitions

A vocabulary was introduced and reviewed continuously throughout these two weeks.

1. Atmosphere--the air that surrounds the planet earth.
2. Clouds--large or small amounts of collected water vapor.
3. Condensation--the cooling-off of water vapor.
4. Evaporation--to vanish from a water body or planets to form vapor.
5. Gravity--the force of the earth that holds things down.
6. Ground water--that water which is held below the ground.
7. Precipitation--the falling rain, snow, hail, sleet, or dew.
8. Pull--to use force in order to draw near.
9. Surface water--those bodies of water which can be seen; such as a lake, river, ocean, or pond.
10. Transpiration--the way plants put water back into the atmosphere.
11. Water vapor--invisible water suspended in air.

To impress the vocabulary on the children, lead-mobiles were placed on the ceiling, word puzzles were made for each word, and two activity sheets were constructed based on reading levels. Activities were presented on each sheet also in accordance with reading levels. Flash cards were made for demonstration purposes. A "Water Cycle Game" was initiated using word puzzles. An Ecology Word

Game and a Definition-Hunt Game were also used. Vocabulary words were copied in Ecology Notebooks and were used to diagram the Water Cycle for an Art lesson and testing. (See Appendix S.)

Lesson Plans

INTRODUCTION TO WATER CYCLE (1)

1:15-1:35 p.m. Literature

Story telling--to set the stage for new unit. Tell the story "The Ecowizard" (see Appendix R) to the children.

1:35-1:45 p.m. Relief Exercises

Have the children stand, then call the names. Each child is to come forward and pick up his or her Ecology Kit which was left by the Ecowizard.

1:45-2:15 p.m. Handwriting

Tell the children to look through their kits. Take out Ecology Notebook and turn to the first clean page. The Ecowizard left "Four Responsibilities" which has to do with:

Responsibilities for Ecologist

1. Do neat and careful work.
2. Keep a record of everything.
3. Be able to report to the class.

4. Always work towards keeping the environment clean.

From the Ecowizard

Tell the children to use their very best handwriting. Practice all the rules for good penmanship. The teacher went over each responsibility. They were then copied one by one into their notebooks.

2:20-2:45 p.m. Art

Ecology Flash Cards (see Appendix S) and scissors were passed out. Tell the children to separate the cards along the dotted lines. When finished the flash cards were placed in the envelope in the back of their notebooks.

WATER CYCLE (2)

1:15-1:35 p.m. Vocabulary Reviewing

Allow children with pointers to work from Leadmobiles.

The teacher pantomimes a water cycle word. If the child holding the pointer cannot guess the correct word he gives the pointer to another student.

The child who guesses correctly gets a point. The child with the most points at the end of the game wins.

1:35-2:05 p.m. English--Letter Writing

Children wrote to Station WJLK requesting an ecology pin.

The letters they wrote may be found at the end of this Water Cycle (2) section. Each pupil-teacher aided her two children in form, wording, and completing rough copy.

2:05-2:45 p.m. Science

Filmstrip "What Makes Things Dry Faster" (129).

Pupil-teachers read to their two children. The questions in the filmstrip were read and answered by the children. The remainder of the filmstrip told them if their answers were correct.

2:45-2:50 p.m. Reading

Dictionary meanings for overall ecology unit were received. Since groups had to begin performing as one unit, no group could answer unless all agreed. Ecology words were placed on desks.

FIRST-YEAR LETTER

April 10, 1973

Dear Sir,

In our first grade class we are studying ecology.

May I join your team?

Sincerely,

Ecologist (Child's last name)

THIRD-YEAR LETTER

April 10, 1973

Dear Sir:

I would like to become a member of the WJLK Ecology Team.

I am a third grader at Spring Garden School.

My class is studying a unit on Ecology now.

I am very interested and would like for others to become aware of Ecology and its importance to our environment.

Sincerely,

Child's name

WATER CYCLE (3)

1:15-1:45 p.m. Review Vocabulary

Use activity sheet number two for younger children. Explain and discuss, and have pupil-teachers go over sheet for five more minutes.

First year Group-Art--follow the instructions on activity sheet number 2 (see Appendix C).

Third year Group-Phonics--do activity sheet number one (see Appendix C).

1:45-1:55 p.m. Music

Begin teaching song "What Makes the Weather".

Go over words with and without music. Then have the children sing along with the record.

1:55-2:25 p.m. Science

Show filmstrip "How Does Water Get Into the Air".

Have children repeat same procedure used with the first filmstrip shown. Show only first half of filmstrip. Set up the three experiments as shown in filmstrip. Review the questions from filmstrip which will need to be answered upon completion of filmstrip three days later. Questions from filmstrip were copied from board by third graders and rex-o-graphed for first graders.

These experiments were used in order to show the water cycle in mini form. The experiments also demonstrated some of the vocabulary--precipitation, transpiration, pull, water cycle, evaporation, and condensation.

2:25-2:40 p.m. Reading

Use word puzzles to go over Water Cycle words. Have each group of ten children perform as a team.

2:45-2:55 p.m. Dictionary Work

Read meanings to children from ecology vocabulary. Have individual children give the correct word.

Prepare for Friday's Ecology Word Contest between the boys and girls.

Question: How does water get into the air?

Taken from filmstrip:

1. Where did the water come from the inside of the jar?
2. What happened when Johnny breathed on the mirror?
3. What happened to the water in the jar with no lid?

This filmstrip aided in vocabulary development.

WATER CYCLE--CLOUDS (4)

1:15-1:35 p.m. Oral Discussion

Place questions on experience chart paper:

1. What would happen if gravity were the only force at work on the earth?
2. What pulls the water from the oceans and other water bodies?
3. Where does the water go after it is pulled from the water bodies?
4. How does it (water) get back to the land?

Allow ten minutes for discussion. Remind and refer children to filmstrips in previous lessons.

Review experiments from those lessons.

Do not give answers. Listen!

1:35-2:10 p.m. Science

After the discussion period pass out Water Cycle Diagram Number 2. Allow five minutes for review of words. Discuss physical factors of diagram in relationship to the questions on the experience chart paper.

2:10-2:20 p.m. Math

Pull out the word Water Vapor. Use high, higher, highest, few, less, more, up, down, low, lower, lowest. Teacher diagrams on board as she talks. Water vapor rises very, very high into the air. When it gets far, far up into the air it forms Cirrus clouds. Cirrus clouds are the highest in the air and are formed by tiny drops of water vapor. They are crystal-like in appearance.

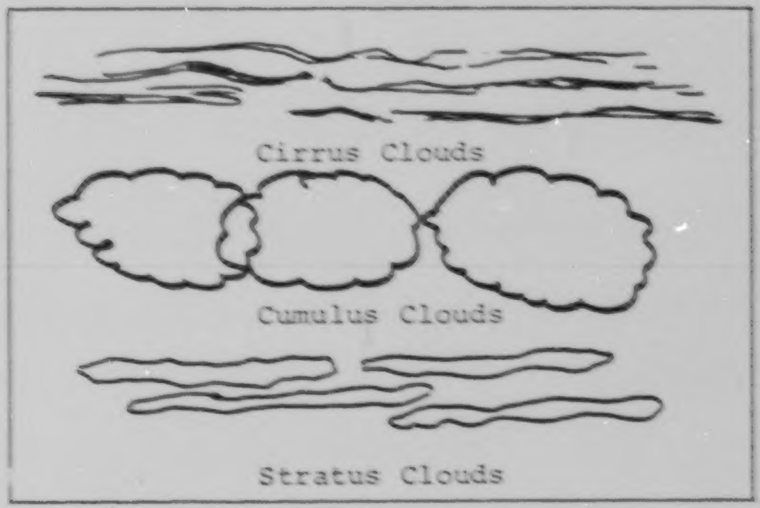
Big fat, puffy clouds that are lower than the Cirrus clouds are called Cumulus clouds. The lowest, flat clouds that stretch across the sky are called Stratus clouds.

2:20-2:50 p.m. Art

Illustrate all three types of clouds. Pass out black construction paper 12" x 18" and cans of rubber cement. Have children put name and date on name tag pasted in corner. Give each group a box of cotton and one stick of white chalk for labeling.

Make the highest clouds first--Cirrus.

Make the next group of clouds Cumulus.



Make the clouds that are lowest in the sky--Stratus.

Label each cloud. Remember what clouds look like and check diagram on the board.

WATER CYCLE (5)

1:15-1:35 p.m. Vocabulary

Using flash cards, the children will review: condensation, evaporation, rain, clouds, atmosphere, and water vapor.

1:35-1:50 p.m. Handwriting

After the review the children wrote these words in their ecology notebooks. As each group completed writing in their books, they took their science questions to the science table.

1:50-2:15 p.m. Science: Observation

The questions were reviewed and answered by the children from their observation of each experiment. Each group's answers were recorded.

2:15-2:35 p.m. Science: Reading

The last part of the filmstrip was shown. The children were asked to listen (the teacher read as she showed the remainder of the filmstrip). The children were to check the answers from the filmstrip with their work.

2:35-2:55 p.m. Dictionary

After checking papers the groups prepared for "Definition Hunt" game.

WATER CYCLE (6)

1:15-1:35 p.m. Review

Review vocabulary using water cycle and word puzzle game.

1:35-2:00 p.m. Science

Diagramming--use flannel board and flash cards with flannel on the reverse side. Have children place flash cards on flannel board in correct position for the particular process described by the word mentioned.

Example: Clouds would be placed at the very top of the flannel board while precipitation would be placed under the clouds and condensation would be placed on the clouds. These completed diagrams with pictures and words were then placed in the ecology notebooks.

2:00-2:25 p.m. Art

After placing the water cycle diagram in the ecology notebook the children were to color their picture. While the first graders were coloring the diagram the pupil-teachers were given a very technical xeroxed copy of the water cycle as shown on page 76. This one, they were to color for exhibit purposes later in the unit. It was stapled into their ecology notebooks. They were also to review their water cycle words, check diagramming and labeling.

2:25-2:35 p.m. English

Children were to write initials and names with capital letters. After a little discussion on initials and their uses, three small 4" x 2" labels were passed out to each child. On each label they were to put their first initial and complete last names. Pupil-teachers were to assist first graders and then complete their own. This lesson was necessary due to the number of projects within the learning centers needing to be identified. After labels were checked they were then clipped into the ecology folder pockets.

Take out rough copy of letters. Give first graders new sharpened pencils to do their good copies. Give third graders ball point pens for their final copies. Complete and mail to Station WJLK, Asbury Park, New Jersey.

The teachers also enclosed a letter (see Appendix T).

TESTING DAY

1:15-1:30 p.m.

Phonics.

Word puzzle game.

Reading.

1:30-2:00 p.m.

Pass out xeroxed copies of the water cycle. Have individual children read two or three sentences at a time.

Use a globe and have a child find the antarctic.

1. What kind of environment does it have? (Cold, snowy, no green plants--accept any reasonable answers.)
2. What happens to the snow? (It evaporates into water vapor; it condenses back into liquid.)
3. What does "state" mean in the first paragraph? (Water can be liquid, solid, or gas; being something.)

Read the Travels of Water to each other. Pupil-teachers direct the reading within your groups. Read softly--very softly. Allow ten minutes. Teachers circulate and help where needed.

2:00-2:20 p.m. Science

Have children view film "Our Friend the Water."

2:20-2:45 p.m.

Pass out simplified Water Cycle Sheet #2. The children are to diagram using their water cycle vocabulary (see Appendix S). This Water Cycle Sheet #2 was the test for the completion of the Water Cycle.

The Food Chain Cycle

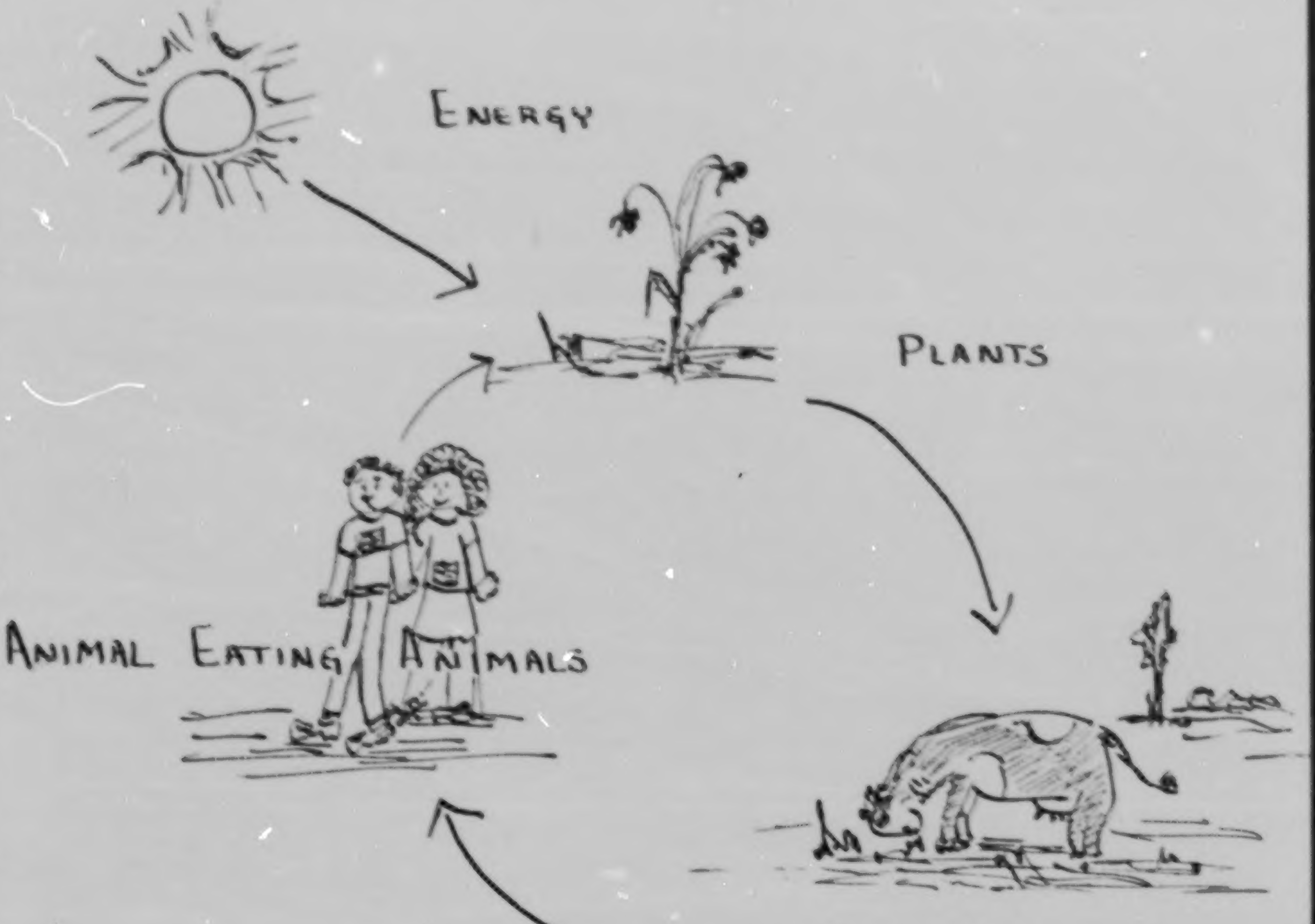
Facts and Understandings

All plants and animals are linked together by sharing the same earth, air, and water. They are also linked by a competition for solar energy, on which their lives depend (29, p. 104).

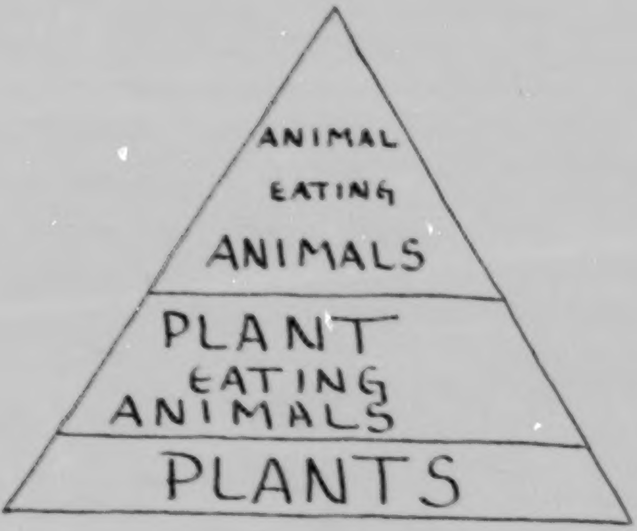
The food chain itself, in any given instance, is the product of the plants and animals in the habitat, as well as their arrangement in a number of ecological niches (29, p. 107).

Plants are the producers in a food chain; they make their own food. Animals in the chain are the consumers; they derive energy from plant matter, whether they eat plants or plant-eating animals. When members of

FOOD CHAIN


ENERGY
PLANTS
ANIMAL EATING ANIMALS
PLANT EATING ANIMAL

FOOD PYRAMID


ANIMAL
EATING
ANIMALS
PLANT
EATING
ANIMALS
PLANTS

the food chain die, decomposers chemically break down their bodies into nutrients--minerals used by plants for growth.

The following lessons are based on the above principles, taught at the primary level (10, p. 52).

Food Chain Cycle Terms and Definitions

1. Adaptation--any part of an organism that changes to better live in its environment.
2. Amphibian--an organism that lives on land and water.
3. Animal-eating animal--an animal that eats other animals for food.
4. Bacteria--an organism that helps things to decay or rot.
5. Bird--an animal that has feathers, lungs, and breathes air.
6. Decay--to rot or decompose.
7. Dependence--needing another organism to live.
8. Fish--an animal with fins, scales, and lives in the water.
9. Food chain--the way in which organisms within an ecosystem feed on each other.
10. Habitat--where an organism lives.
11. Insect--an animal with six legs and three body parts.
12. Link--one part of a chain.
13. Mammal--an animal with hair on its body, lungs,

breathes air, and feeds milk to its babies.

14. Photosynthesis--the way in which green leaves on a plant take sunlight and turn it into food for the plant.

15. Plant-eating animal--an animal that eats plants for food.

16. Predator--an organism who lives by eating other organisms.

17. Protection--the way an organism keeps from getting hurt or eaten.

18. Reptile--an animal with scaley skin, lungs, and breathes air.

Lesson Plans

FOOD CHAIN CYCLE (1)

1:15-1:45 p.m. Math and Art

Children were shown the ecology flag. They reviewed the symbolism: (1) the ⊖ was a Greek symbol meaning death, (2) the green stripes mean clean earth, and (3) the white stripes mean clean air.

The children were instructed to turn to the next clean page in their ecology notebook and listen to the directions on how to make and label an ecology flag of their own.

1. Across the top line measure one inch from the left and put a dot. From this dot, across

the top line, using a green crayon, draw a three-inch line.

2. From the first dot measure down two inches and make a green line.
3. From the bottom of the two-inch line measure across three inches.
4. From the right side ends of the three-inch lines join them with a two-inch line.
5. From the first dot measure across one inch and put a pencil dot.
6. Measure from the second dot, down one inch.
7. From the third dot measure back one inch.
8. In this one-inch square place the Greek symbol for death.
9. Observe the flag on the board and draw four green lines where they are shown.

The children are then shown the ecology stamp they have made from the ecology flag. The stamp is used to correct papers in the centers and in the lessons.

1:45-2:00 p.m. Health

Ask the children "How do we move?" Elicit the response Energy. "Where do we get energy?" Sun.

Give the definition of the food chain cycle--the way in which the organisms in the community feed on each other. Drill the definition.

Show the children a piece of chain. Explain that each part of a chain is a link; without every link a chain is not complete.

The biggest link in the food chain is the plants.

The teacher then goes over the parts of a flower, using Instructo science demonstration cards. Then the teacher reviews, through discussion, what a plant needs to grow. This is placed on the blackboard.

2:00-2:15 p.m. Science

Pass out a ditto sheet, "A Plant Has Parts," for the pupil-teachers to read to the pupils (see Appendix S). Following this another ditto sheet is passed out to be filled in by the pupils with the help of the pupil-teachers. This ditto contains parts of the plant and what plants need to grow (see Appendix S). This information is in the front of the room.

Play "How Do Seeds of Plants Travel?" (133).

2:15-2:45 p.m. Experiment

How can we prove that plants need these certain things to grow?

Set up the experiment (see Appendix S). The children are in nine groups. Each gets soil, water, peat pot, and seeds to carry out the experiment.

FOOD CHAIN CYCLE (2)

1:15-1:30 p.m. Review English

What do we need to move? Energy. Another name for energy is . . .? Power. Where do we get this energy or power? Sun and food.

Who can find the word "energy?"

Children locate the word energy at the top of the food chain mobile (see Appendix S). Review the definition of food chain. Place it on the blackboard. Children turn to next clean page in their ecology notebook and copy the definition.

Play "What Foods Should We Eat Every Day?" (133).

1:30-1:45 p.m. Creative Dramatics

What is the largest link in the food chain cycle? Plants. Where do plants get energy? Sun. Where do plants get food? (Allow time for speculation.) Give children the definition of photosynthesis--the way green leaves take the sun and change it into food.

Divide the children into four groups around the room. Review quickly how plants develop from seeds, and with the proper growing environment, turn into plants.

Play "Creative Movement" record (133) and have children play-act growing into a plant with the help of the sun.

To emphasize photosynthesis, do experiment on the hyacynth leaf (see Appendix S).

1:45-2:15 p.m. Literature

The second link of the food chain is animals.

Refer to the mobile. There are six kinds of animals--reptiles, insects, amphibians, fish, birds, and mammals.

Using a flannel board, place the word and definition for each animal. Introduce a picture for each word.

Pass out the pictures to the children. The children come to the front of the room and match the picture to the word. Next pass out the definitions for the children, one at a time, to match to the word.

Next pass out a book to each of the nine groups: The Reptiles, The Birds, The Sea, Frogs and Foods, Insects, The Mammals, The True Book of Reptiles, The Birds (Random House), The First True Book of Fishes. Allow time to look through the book. Instructions: (1) when called on, identify the type of animal your book is about,

(2) locate a particular animal of that type, name the animal, and show it to the class.

2:15-2:45 p.m. Art

On an easel, with experience paper, illustrate the food chain cycle.

Name the parts, particularly introducing the difference between plant-eating animals and animal-eating animals.

The cycle begins with the plant, which gets its energy from the sun. It does not really end with an animal-eating animal dying because decay works on the dead animal to make it small enough for the plants to use. Do all animals just eat plants? Which is the largest link? Plants get energy from the sun and through their roots. All life gets energy indirectly from the sun through food. All animals need or depend on each other. One link is helpless without the other.

Children turn to the next clean page in their ecology notebook, draw and label the food chain cycle.

FOOD CHAIN CYCLE (3)

1:15-1:30 p.m. Creative Dramatics

Review mobile with animals and as each animal is reviewed have two groups act out an animal of this type, naming their animal as they finish (one at a time) and whether he is plant-eating or animal-eating.

1:30-1:45 p.m. Weather Science

Use a flannel board with an Instructo flannel girl and a variety of clothes for a variety of weather conditions. Dress the child in shorts and blouse and set the thermometer at 80°. Ask the children for their observations as to why the girl is dressed in that particular way. Next set the thermometer at 30° and ask a child to come and help the girl change to fit the weather in her environment. Or to adapt to her environment. Do this with a variety of temperatures. Finally, put the temperature at 0°. Now it is too cold for the girl. Now not even her clothes can help her to adapt to her environment. She has to go somewhere. Where do you think she lives and what do you think it looks like? This is her habitat. Ask the children to describe the habitats of the various animals.

1:45-2:00 p.m. English

Review the vocabulary on the mobiles. Pass out an activity sheet with the vocabulary on it with missing letters (Appendix C). All children fill this in. Paper is stapled into ecology notebook.

2:00-2:15 p.m. Show Filmstrip

"Animal Protection." This filmstrip shows a variety of animals and how they protect themselves from predators. For each frame ask these questions: What is the name of the animal (the type)? What does the habitat look like? What type of protection does this animal have?

2:15-2:30 p.m. Math

Review the filmstrip and establish the fact that plants and animals depend on each other and that without each link the food chain would not be in balance. Pass out a triangle shape, four inches on each side. Have children label books "Food Pyramid." Have children trace the pyramid on the next clean page and label it as on the board: Plants, Plant-eating animals, and Animal-eating animals. Stress the concept that there are more plants than animal-eating animals.

2:30-2:45 p.m. Botany

How does the cycle start over again? The animal dies and bacteria works on him to decay his body for the plants to use. We will see decay by the following activity (see Appendix S).

Each group is given a jar lid, bread, and water. The nine lids are placed in a warm, dark, moist place to grow. The results will be observed in the nitrogen cycle.

FOOD CHAIN CYCLE (4)

1:15-1:30 p.m. Phonics

Review all the vocabulary. Pass out the word cards to the groups of children. The class reads the definition and the group that has the word stands up.

1:30-1:45 p.m. English Grammar

Go over the mobiles, words, and definitions. Review the words producer, consumer, and decomposer. Locate the producers, consumers, and decomposers on the mobile. Have the children name them.

Stress the fact that plant-eating animals are producers and consumers, and that bacteria are decomposers. Have the children name specific plants, plant-eating animals, and animal-eating animals.

1:45-2:00 p.m. Literature

Refer to Ecology (29, pp. 105-109). This is an example of a food chain different from ours. Go over the story and show the pictures. The dragon fly is the plant-eating animal; the animal-eating frog eats the dragon fly; the animal-eating snake eats the frog; the animal-eating hawk eats the snake.

Stress the words habitat, protection, and predator. Have children identify the predators in this story. Have them identify the predators in their food chain.

2:00-2:15 p.m. Geography (Social Studies)

Show the filmstrip "Grassland Community" (127). This is a visual review of the food chain cycle vocabulary. Identify habitat, plant-eating animal, and animal-eating animals. Who is the producer, the consumer, and decomposer. This film stresses balance and dependence.

2:15-2:30 p.m. Handwriting

Copy the food chain cycle vocabulary into the ecology notebooks. As the children finish they can come to the front of the room and pick a library book on animals to look at as the others finish.

2:30-2:45 p.m. Art Appreciation

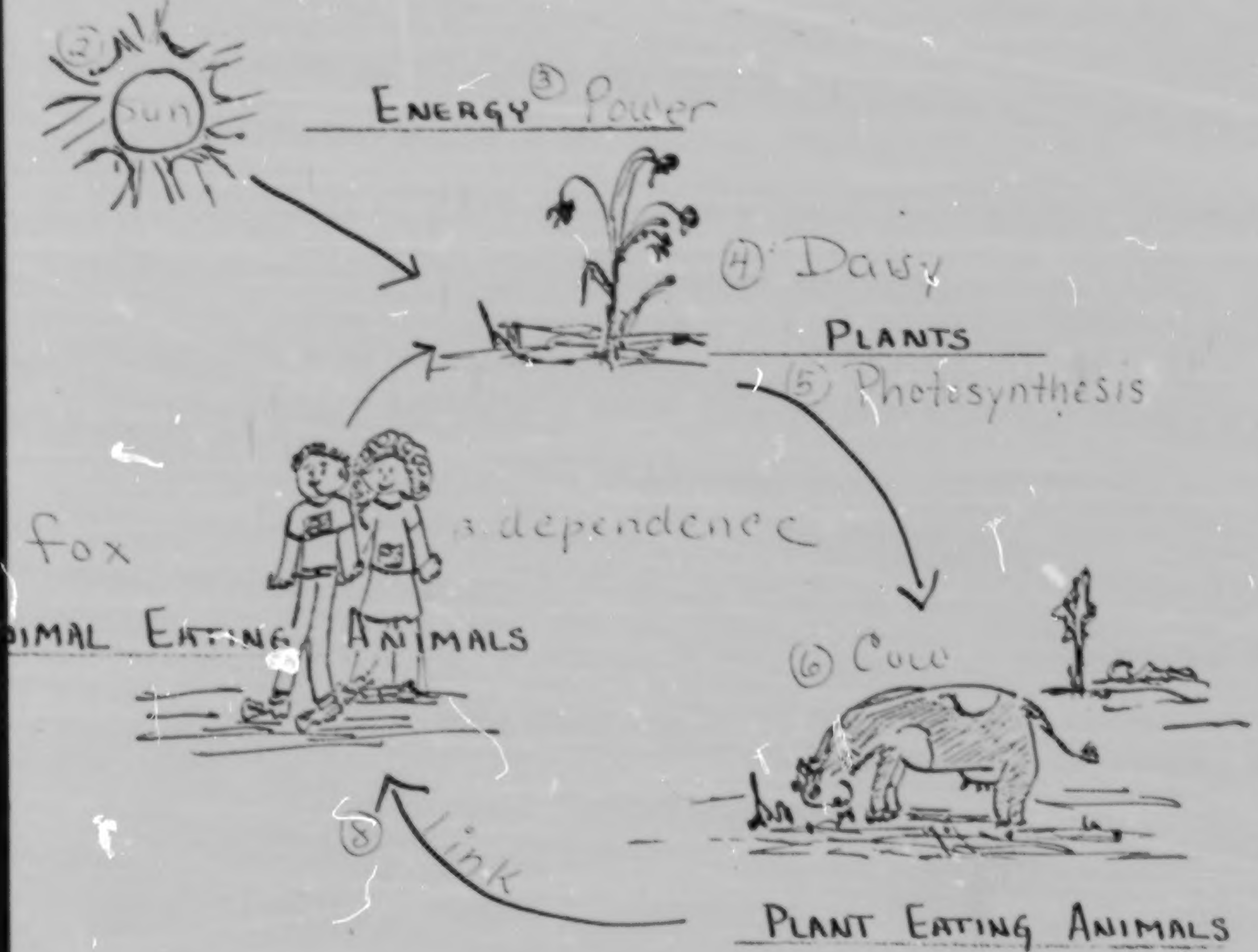
The children are shown the ecology buttons they have received for writing to WJLK, the radio station, to join the ecology team. They will receive these buttons as they finish their test and they will wear them each day. See test sample on next page.

Test

The children were given a copy of the food chain cycle. They were told to point to particular areas of the cycle as the questions were asked, and to write down the answers.

me Date

FOOD CHAIN ① cycle


② Sun
ENERGY ③ Power
④ Daisy
PLANTS
⑤ Photosynthesis
dependence
fox
IMAL EATING ANIMALS
⑥ Cow
⑧ link
PLANT EATING ANIMALS

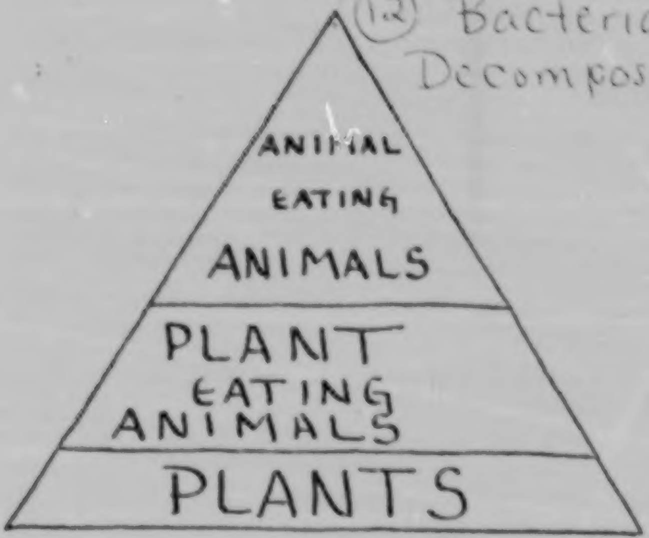
FOOD PYRAMID

⑪ Consumer

Producer - Consumer

⑨ Producer

⑫ Bacteria - Decomposer


ANIMAL EATING ANIMALS
PLANT EATING ANIMALS
PLANTS

Questions:

1. We talked about food chains and how they continue again and again. What word is missing from the title? Cycle.
2. Where does everything get its energy? Sun.
3. What is another name for energy? Power.
4. Name a plant. Any green plant.
5. What do plants do to make food? Photosynthesis (located on mobile).
6. Name a plant-eating animal. Any animal, i.e., cow.
7. Name an animal-eating animal. Any animal, i.e., fox.
8. What is a part of a chain called? Link. Producer, consumer, and decomposer were written on the board.
9. Are plants producers, consumers, producer-consumers, or decomposers? Producers.
10. Are plant-eating animals producers, producer-consumers, consumers, or decomposers? Producer-consumers.
11. Are animal-eating animals producers, producer-consumers, or decomposers? Consumers.
12. In order for animal-eating animals to be useful to plants, what has to work on the dead animal-eating animals? Bacteria.

13. Is bacteria a producer, consumer, or decomposer? Decomposer.

14. All these plants and animals need each other. What is the word for needing? Dependence.

1:00-1:30 p.m. Science

1. The experiment with the nine plants is reviewed and checked off as to: did grow, or did not grow.

2. The contest is held, it is a food-chain bingo game (see Appendix S).

1:30-2:45 p.m.

Children work in their centers.

1:00-1:30 p.m. of a learning center day during the food chain cycle.

Preparation lesson: English

To provide practice in forming interrogatory sentences. To review the punctuation of sentences. To have them prepare a leadmobile. To have children learn how to formulate questions for guest speaker.

Have children read each sentence and underline lead words.

1. What did Sam's mother do?
2. Who lives in the green house?
3. How do people grow tulips?

4. When does school open?
5. Where is your coat?
6. Why is the paper torn?

Pass out paper and have children write and underline lead words in the following sentences and put in the proper punctuation.

1. Who went hunting
2. What did the boy point at the squirrel
3. Where did he hide
4. Books are fun to read

Collect completed papers. Direct children's attention to Question Leadmobile. Have individual children read from the mobile.

Activity:

Pass out yarn to each child. Since each word in the mobile was made in mini size they were also distributed. Children were asked to observe carefully the large mobile. Then they were asked to take their time and put one together exactly like the large one.

After the activity, homework was assigned to the group to be copied. Write three sentences you would like to ask Mr. Rein (Resource person who would be visiting the group).

Use your lead words and do not forget the proper punctuation.

1:30-2:00 p.m. Lecture

On April 26, 1973, Mr. George Rein presented a general speech on Environments and Pollutants. (137)

2:00-2:15 p.m. English Lesson #1

Children were extended this time to question Mr. Rein. (They used questions prepared during a previous English lesson.)

2:15-2:35 p.m. Science

Children viewed film "What Are We Doing to Our World?"

2:35-3:00 p.m. Botany and Math

Mr. Rein had set up an experiment table. He placed cow manure on the table and used it to show how waste could be helpful. Then he placed two tomato plants on the same table. These he had grown from seeds and they were about four inches in height.

Mr. Rein brought all the ingredients for the children to plant their own tomato seeds and showed the children how to plant them. He told them the length of time the seeds would need before growth would be seen. The children checked their calendars and circled the date the seeds were planted and also the date Mr. Rein said growth would appear.

The class was to do word problems and number sentences pertaining to the plants, using the calendars as a follow-up for this part of the lesson.

The class was also to provide a good environment for the plants. Mr. Rein closed his speech with the four things plants needed to grow well. Then he reminded the children of the need for fertilizer (manure). He stated that it was an important element of the food chain cycle and that it would help them when they reached the nitrogen cycle.

1:00-1:30 p.m. of a learning center day during the food chain cycle. English Lesson #2

1. To review capitalization and punctuation of letters and to give practice in writing a thank-you letter.
2. To incorporate art and science in preparation of the thank-you letter.

This thank-you letter was written to Mr. George Rein for his visit to our classes. Children were given 8" x 10" white drawing paper, folded in half. On the inside the children wrote the note.

Dear Mr. Rein,

We appreciated all the information you gave us about ecology.

We are enjoying the tomato plants you brought to us.

Sincerely,
(Child's name)

After the note was completed in proper form we were ready to prepare the front of the note.

Art--Still Life

Water color boxes.

Water pans.

Black fine-tip felt pens (for labeling).

Newspaper.

Water buckets.

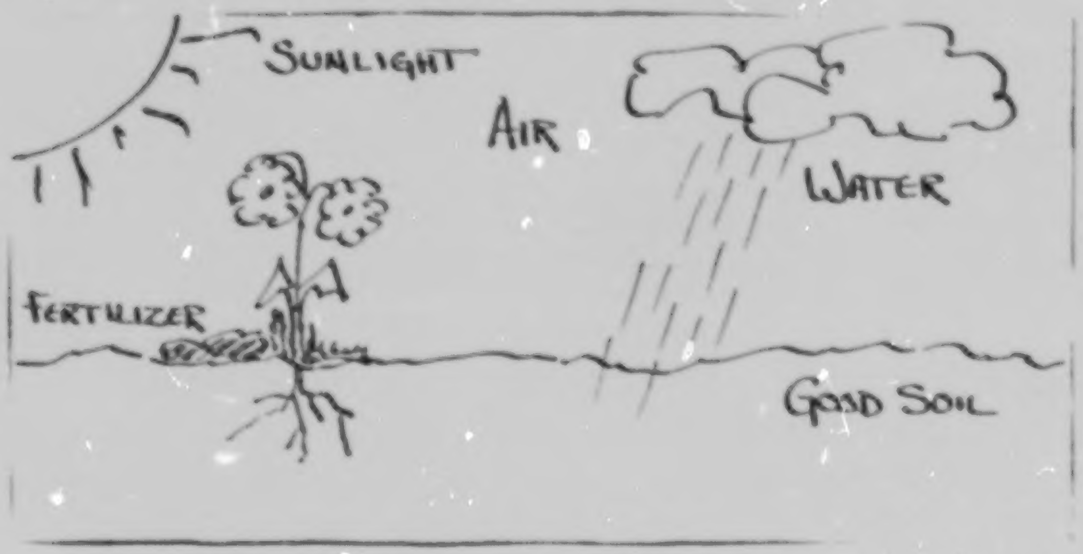
On the front of the card the children were to paint a picture of Mr. Rein's tomato plants. These plants were placed on a desk in front of the classroom and the children were instructed to paint exactly what they saw.

Science

After cleaning up from Art the children were asked to recall the proper environment plants needed for growth. (See illustration at the top of the next page.) The children were then called on to give the answers, which were placed on the bulletin board. These words outlined or labeled parts of the plants they had placed on their papers.

After the notes dried, they were mailed to Mr. Rein's home in Titusville, New Jersey. This visit completed the Food Chain Cycle.

Proper Environment for Plants



The Nitrogen Cycle

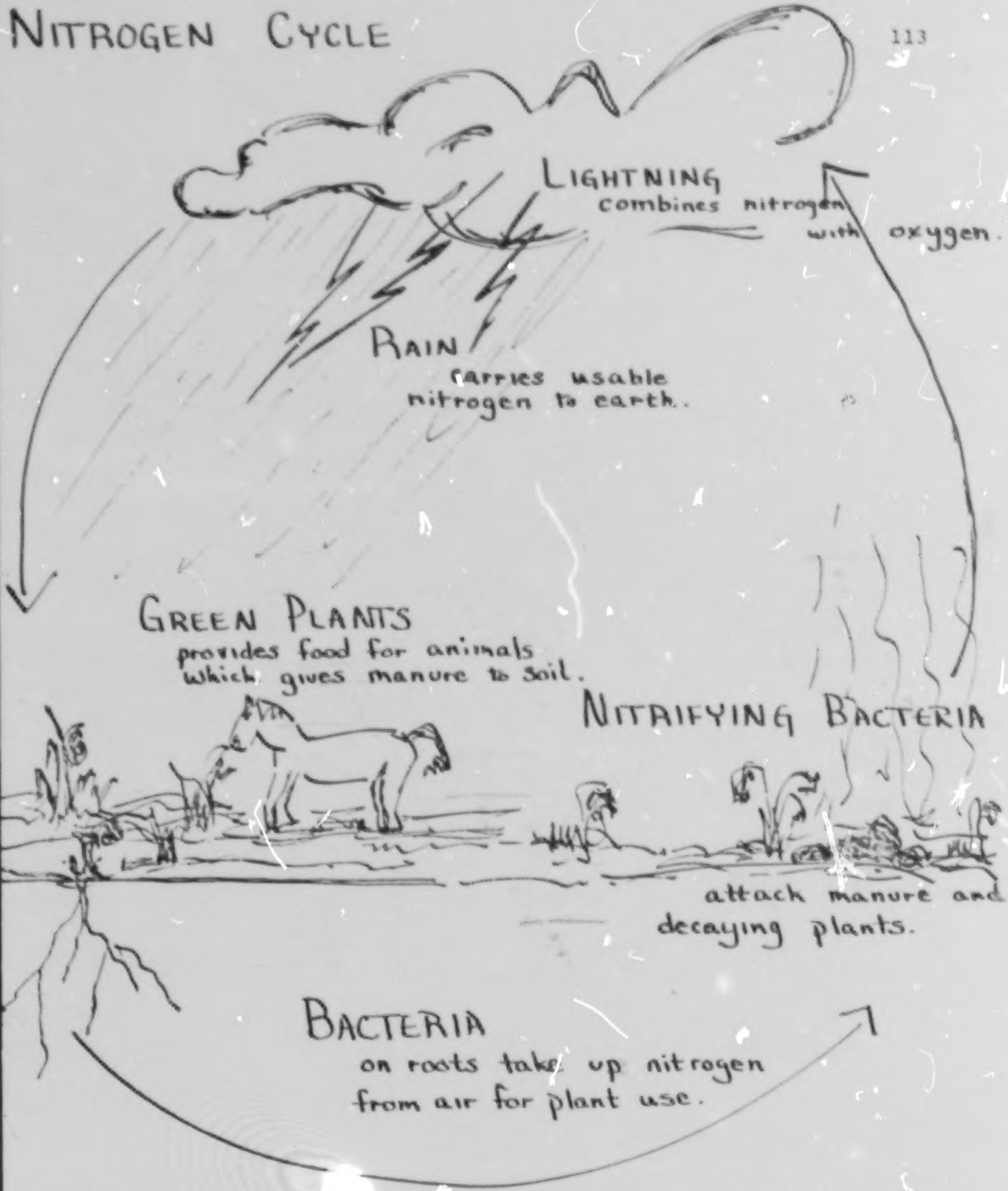
A visit to a nearby high school science laboratory was planned in order for the children to participate and observe experiments dealing with nitrogen. Since the trip would take place after this paper has been presented for typing the results of the trip cannot appear.

Facts and Understandings

The nitrogen cycle in nature combines readily with carbon dioxide and oxygen to form a limited number of molecules. Within this cycle these three gases work constantly together in order to facilitate the life process.

The nitrogen cycle is a self-regulating system that maintains the proper combination of carbon dioxide,

NITROGEN CYCLE



LIGHTNING
combines nitrogen with oxygen.

RAIN
carries usable nitrogen to earth.

GREEN PLANTS
provides food for animals which gives manure to soil.

NITRIFYING BACTERIA
attack manure and decaying plants.

BACTERIA
on roots take up nitrogen from air for plant use.

oxygen, and nitrogen so that both animals and plants are sustained by the same medium, even though the waste produce of one is the life's blood of the other.

The nitrogen cycle, a biogeochemical cycle, deals with molecular recombinations in diverse chemical reactions and it is the only cycle which encompasses all four sites (air, soil, water, and organisms). The other cycles only encompass two sites (37, pp. 18-20).

Aims

1. To have children work with a more complex natural cycle than the Water Cycle and the Food Chain Cycle.
2. To gain an understanding of how the Nitrogen Cycle combines functions in the atmosphere, soil, and the bodies of animals.
3. To improve the children's understanding of gases in the air (carbon dioxide, oxygen, and nitrogen).
4. To promote the desire to produce work independent of teachers and based on past work in cycles.

Nitrogen Cycle Terms and Definitions

1. Bacteria--an organism that works on decay and waste.
2. Death--the ending of any form of life.
3. Decay bacteria--bacteria that changes waste and dead organisms into nitrates.
4. Green plants--plants with green leaves that make their food through photosynthesis.

5. Lightning--a flash of electricity in the sky.
6. Manure--the waste products of animals used in the soil as fertilizer.
7. Nitrates--what nitrogen changes into by the action of lightning or bacteria.
8. Nitrogen--a colorless, odorless, tasteless gas that forms four-fifths (most) of the air.
9. Nitrogen cycle--the way nitrogen changes into nitrates to work with carbon dioxide and oxygen to keep all organisms living.
10. Oxygen--a small part (one-fifth) of the air made by plants and used by animals.
11. Protein--a necessary part of cells in plants and animals, found in milk, cheese, eggs, meat, beans, and peanuts.
12. Rain--water falling in drops from the clouds.
13. Waste--the food not used by the body, that is given off by people and animals.

Lesson Plans

NITROGEN CYCLE (1)

Introductory Lesson--Tuesday

The nitrogen cycle was divided into three areas: atmosphere, body, and soil. The atmosphere area and vocabulary will be introduced first. The vocabulary consisted of six words:

1. nitrogen
2. oxygen
3. carbon dioxide
4. lightning
5. rain
6. nitrates

Therefore, when the large "nitrogen machine" was constructed (a tachistoscope) the words were so arranged on the "machine" that they would tachistoscopically appear when needed. The vocabulary was introduced by the use of a pulley line across the room.

1:15-1:45 p.m. Vocabulary

Questions children were asked to encourage review and to introduce new words:

1. From where does all energy come?

   Class: The sun.

   Activity: Clip up on the pulley line a large, yellow sun.

2. Will someone name the gases the sun contains (is made up of)?

   Class: (1) oxygen, (2) nitrogen, (3) carbon dioxide.

   Activity: Place the three name tags on the face of the sun--oxygen, etc.

3. Where else would these gases be found?

   Class: In the atmosphere around the earth.

   Activity: Take the chemical symbols for oxygen O, carbon dioxide CO_2, and a very large N for nitrogen. Place these symbols on the pulley.

4. What else would you find in the atmosphere?

   Class: Clouds.

   Activity: Place a large cloud on pulley.

5. What comes from the clouds?

   Class: Rain.

   Activity: Place the word rain on the cloud.

Continue with this type of questioning until the complete atmosphere is simulated.

1:45-2:00 p.m. Phonics

Bring out Nitrogen Machine. As the knob is turned children will say the first six words listed. Read and answer questions contained in this first area on the machine.

2:00-2:30 p.m. Music Appreciation

William Tell Overture.

The children are asked to look at the "atmosphere" just simulated and think of what needs to happen to the nitrogen in the air. Allow the record to play to the "Storm" portion. Just as the record arrived at this segment the lights were turned off. The teacher instructed the children to create the type of weather depicted by the music. The children began to sway like trees in a heavy wind. The lights were flashed off and on to represent lightning. Some children began to clap their hands to depict thunder.

While they were involved in the music, the teacher placed a constructed piece of electricity under the cloud. She then began to pull the string, which caused the atmosphere to move. When the lightning comes in contact with the large N (representing free form nitrogen) from a pocket connected to the N, she pulls out a string of nitrates n_2.

By this time, the calm music (Morning Song) has begun and all the children are to be thinking about what has just taken place.

2:00-2:10 p.m. Music--Relief Exercise

Standing, the children will sing the portion of "What Makes the Weather" that asks "What Makes the Lightning?"

2:10-2:20 p.m. Discussion

Discuss with the children the reasons for the demonstration.

Class: To introduce the Nitrogen Cycle.

Now that it has been introduced, something else is needed that will help us talk about this cycle. Who can tell me what that is?

Class: A definition of the Nitrogen Cycle.

2:20-2:50 p.m. Handwriting

Open your notebooks to the next clean page. Put in the date and this title, NITROGEN CYCLE. Go down to the next clean line and begin, in your best handwriting, this definition. Teacher writes the definition on the board (check vocabulary definitions).

Those who complete the writing before time may go to the Nitrogen Machine and go over only the first six words, softly!

NITROGEN CYCLE (2)

1:15-1:30 p.m. Vocabulary Review

Divide children into two groups; one group works with the "Nitrogen Machine" and the other group works the simulated "atmosphere." while these groups are reviewing the six new words in the above fashion, the teacher has placed on the board, in a list, the same words.

1:30-1:45 p.m. Handwriting

Children were asked to take out their ecology notebooks, and turn to the next clean page. Date the page and title it.

Vocabulary. Copy these new words into your book. When finished, review them with your teacher-pupil.

1:45-2:10 p.m. Relief Exercise (Phonics)

Play Definition-Hunt Game. Take ten minutes to go over definitions of the six new words.

2:10-2:35 p.m. Health

How Does Your Body Get Rid of Waste? (See Appendix S.) Have individual children read portions. Question where needed. Complete activity at the end of paper.

2:35-2:50 p.m. Art

Draw a picture in your notebook of the "Atmosphere." Tell me, from your picture, just what you see! Check books and comment, in quick note form, in child's book.

NITROGEN CYCLE (3)

Second and Third Areas

The second area to be covered was soil. Prepare a large bulletin board with soil and roots a day prior to the lesson.

1:15-1:30 p.m. Science Vocabulary

Use Nitrogen Machine and bulletin board. (Use both teachers.) Introduce six new words and proceed with similar type questions as those used for "Atmosphere."

1:30-2:10 p.m. Experiment--Mold Trays (from Food Chain lessons).

Bring out nine lids of bread mold.

Bag of cow manure.

What are Molds? Read pages 142 and 143 (68).

Are molds helpful or harmful? The children, through the reading, should discover that they may be either helpful or harmful.

Individual groups now observe the bread mold tray that has been placed on a desk within each group. Teacher goes to the soil bulletin board and places the word bacteria on the soil, near the roots, along with six or seven orange dots representing decay bacteria.

Children help to complete diagram on board.

Review new words with the Nitrogen Machine.

2:10-2:20p.m. Relief Exercise

What is manure? Have the children march around the experiment table. As they march they are to carefully observe a large pile of dirt on the table.

Using the five senses (excluding taste) they will be able to tell that it is manure. Review this word on board. Place flash card, word and meaning, on a flannel board. Leave for individual or small group discussion purposes.

2:20-2:50 p.m. Art

The third part of the Nitrogen Cycle to be covered was the body. Children discuss the changes nitrogen must go through before the body or plants can utilize it.

Place a diagram on the board, an illustration, How We Get Nitrogen. Children are asked to copy this in their ecology notebooks. They will do this step by step, teacher directed. Label each step. Color your picture.

NITROGEN CYCLE (4)

Testing Lesson

English

Each group is given a chance to report.

1:15-1:30 p.m. Atmosphere

Three children will give short talks on How Nitrogen is changed to Nitrates in the Air (five minutes per child).

1:30-1:45 p.m. Games

Review words using (a) Nitrogen Machine--speed up the turning knob so that the words appear more quickly than normal, (b) Flash Cards--Atmosphere, and (c) Atmosphere simulated.

1:45-2:00 p.m. English--Soil

Have three other children relate to the class, How Nitrogen is Changed into Nitrates in the Soil.

2:00-2:15 p.m. Games

1. Definition-Hunt Game for six, soil words.
2. Nitrogen Machine Speeded up--class, soil words, response.

2:15-2:30 p.m. Health--The Body Area

Three more children will tell the class, How Nitrogen Gets into Our Bodies.

2:30-3:00 p.m. Test--Art

All necessary materials had been previously packed and labeled--per group. (Package included 12 x 18 oak tag, newspaper, rubber cement, string, and miniature pictures with needed paper clips.)

The atmosphere and soil concepts were to be done by the children and marked as a test for this unit of work.

Pollution

Facts and Understandings

Throughout the world man-made communities have been replacing the communities of nature. However, the principles that govern the life of natural communities must be observed if these man-made communities are to thrive. Man must think less about "conquering nature" and more about learning to work with nature. In addition, each person must realize his interdependence with the rest of nature, including his fellow men. To safeguard life on earth, men must learn to control and adjust the balances in nature that are altered by their activities. (11, p. 54)

Man's efforts to improve his standard of living--through the control of nature and the development of new products--have also resulted in the pollution, or contamination, of the environment. In much of the world today, the air is grimy and suffocating, the land is scarred with litter, and the water is clogged with filth (11, p. 441).

Aims

1. To familiarize children with disrupted cycles, specifically water, food chain, and nitrogen cycles.
2. To inform the children that these disrupted cycles are commonly known as water pollution, earth pollution, and air pollution.
3. To make children realize that these things exist within their own community.
4. To show children that they can do something about pollution.

Pollution Terms and Definitions

1. Conservation--to protect our wildlife and land from harm and misuse.
2. Recycling--To use again and again.

Pollution

A bird's wing beat against
the sky. Soon he will
Air again never fly.
Why?

A fish rolled over and died.
He had nowhere to hide.
Pollution came from
Water every side; Now a skeleton
of fish does glide
Along with the rapidly
rising tide.
Why?

And soon the world will
all be dead
Because man did not
use his head.
Earth And when wildlife
is gone from here,
Will man's conscience
become clear
Of the terrible things he's done?

Soon man won't be
able to run,
Then he'll realize what
he's done.
The battle against pollution
Must be won.

Lesson Plans

POLLUTION (1)

1:15-1:30 p.m. Literature

To set the mood for the study of pollution, a poem is read, "Man's Carelessness" (see Appendix S), and "Pollution" on page 124. The pollution aspects are decided upon and discussed, for example, air pollution, water pollution, and earth pollution.

1:30-1:45 p.m. English

Review the definition of ecology. Point out that we will be discussing the disrupted cycles. Notice picture mobiles.

Pass out pages with pollution problems on them for the children to observe and read. Each group has a picture. On the board is placed three categories--Air Pollution, Water Pollution, and Earth Pollution. Each group has a representative read the page and another representative place it in the correct category. Then all the pictures are reviewed and discussed.

1:45-2:15 p.m. Social Studies

See the film, "The River Must Live." Review the pictures. Establish what is happening to the water to make it polluted. Review the water cycle and see where the inbalance is (51, pp. 128-143).

2:15-2:40 p.m. Ecology

Children review the natural cycles they have learned and the disrupted cycles they are learning. Then children were told to turn to the next clean page in their notebook and copy the following:

Ecology

- I. Natural Cycles
    - A. Water Cycle
    - B. Food Chain Cycle
    - C. Nitrogen Cycle
- II. Disrupted Cycles
    - A. Air Pollution
    - B. Water Pollution
    - C. Earth Pollution

2:40-2:45 p.m. Literature

Review "Man's Carelessness."

POLLUTION (2)

1:15-1:30 p.m. Review Literature--English

Go over "Man's Carelessness," definition of ecology, the names of the natural cycles and the names of the disrupted cycles.

1:30-2:00 p.m. Social Studies

Since we talked about water pollution yesterday, today we are going to talk about earth pollution. Show a beautiful landscape with neatly planted rows of vegetables. Next show a washed-out farm field. How did this happen? (Use opaque projector for these pictures.)

Experiment: Put soil in two trays. Cover one tray with leaves and grass. Sprinkle both trays with the same amount of water. Catch the water that runs from the trays and measure the amount of mud that settles from each. Through discussion point out to children that plants are needed to conserve soil.

2:00-2:15 p.m. Film

View film, "The Third Pollution." Discuss how solid waste is a problem to the environment. Recite "No Littering" by Norah Smaridge.

2:15-2:45 p.m. Botany

Take children out to plant a tree.

Introduce the word recycling. Talk about the things the children are, or could be, recycling. A good example is a milk carton. Take a recycled milk carton for each child. Give each child a "growing block" which has been soaked in water. Place the growing block in the carton. Put three seeds in each hole. Cover the container with a "baggie" and punch nine holes in the top. Water every five days. Indicate to the children that they are helping to beautify their environment and recycling their milk cartons.

POLLUTION (3)

1:15-1:20 p.m. English

Review poem and definitions.

1:20-1:30 p.m. Black History

A short lesson on Garrett Morgan (138).

Read story about Garrett Morgan, who invented the Gas Mask, which may be an alternative when the air becomes too bad to breathe.

1:30-1:45 p.m. Science

Booklets "What is Air Pollution?" were passed out. Children leafed through the booklet indicating causes for air pollution. Especially the last page of the booklet: "And the Future."

These books are to be kept in their ecology folders for future reference.

1:45-2:00 p.m. Social Studies

Show teacher-made slides of the children's environment. Discuss the pollution present and a possible cure for the pollution.

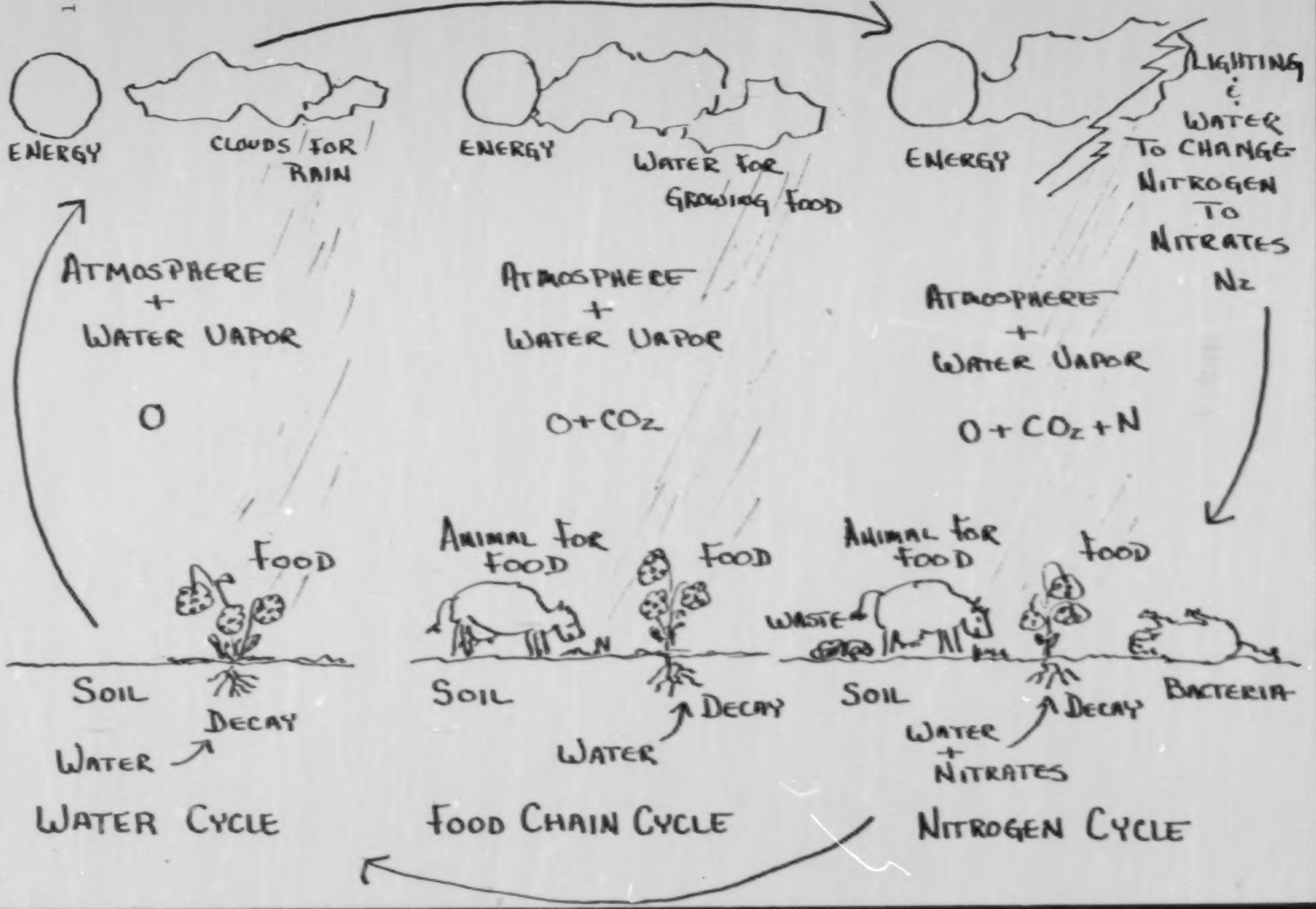
2:00-2:20 p.m. Reading

Large pollution and non-pollution pictures are displayed from a pulley line in the room, enough for each of the nine groups to have one. Two environments are constructed with things contained in the room--one very clean environment and one messy environment. The children are instructed to go to the environment that is the opposite of the picture they have. For example, if a child has a polluted picture he is to go to a clean environment and vice versa. The children are to pretend to be pickets, picketing to have the environment change, if they have a polluted scene they go to the clean environment and tell them how to change it to make it dirty. If the child has a clean scene they go to the polluted environment and tell them how to make it clean. A child is chosen to be a reporter and he interviews the picketers. The picketers are to use their ecology vocabulary in describing how to make the environment the way they want it to be.

2:20-2:45 p.m. Test

The children are instructed to paint, color, draw or write something about pollution and it will be submitted to "Kids for Ecology" for publication.

CORRELATION OF CYCLES


ENERGY
CLOUDS FOR RAIN
ATMOSPHERE + WATER VAPOR
O
FOOD
SOIL
DECAY
WATER
WATER CYCLE
ENERGY
WATER FOR GROWING FOOD
ATMOSPHERE + WATER VAPOR
$O + CO_2$
ANIMAL FOR FOOD
N
FOOD
SOIL
DECAY
WATER
FOOD CHAIN CYCLE
ENERGY
LIGHTING & WATER TO CHANGE NITROGEN TO NITRATES
N_2
ATMOSPHERE + WATER VAPOR
$O + CO_2 + N$
ANIMAL FOR FOOD
WASTE
FOOD
SOIL
DECAY
BACTERIA
WATER + NITRATES
NITROGEN CYCLE

CHAPTER IX

CULMINATING TRIPS

There were two culminating activities for the ecology unit.

The first culminating activity was a neighborhood ecology walk. The children were to observe their environment and identify the producers, consumers, decomposers, cultural, and physical factors (see Appendix U).

The second culminating activity was a trip to Washington's Crossing in Titusville, New Jersey. A nature hike and lesson were arranged for the children.

The children could then observe an environment different from theirs and again identify the producers, consumers, decomposers, physical, and cultural factors.

Lunch was provided by three ladies of the Titusville area.

Upon return to school the children compared and contrasted the two environments. The children then illustrated the environment of their choice.

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BIBLIOGRAPHY

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Filmstrips

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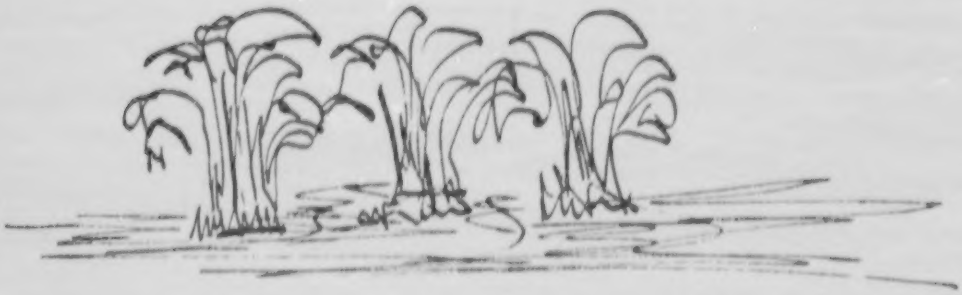
APPENDIX A

DIAGRAM OF FOUR INTEREST AREAS

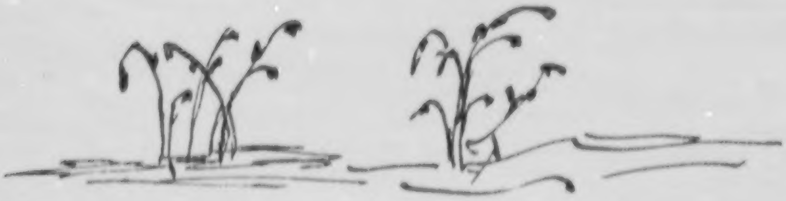
THE FOUR INTREST AREAS

SIGNS OF SPRING

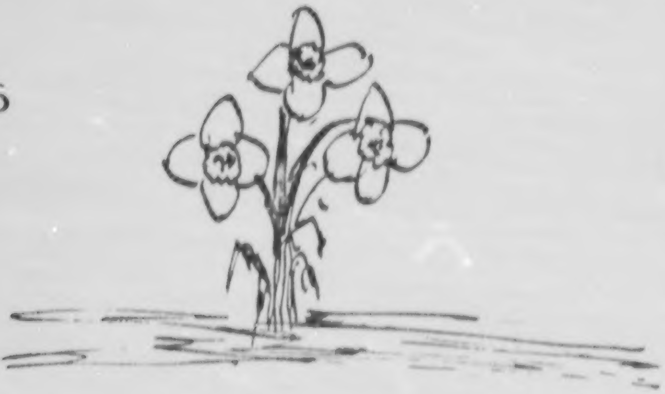
1. FORSYTHIA



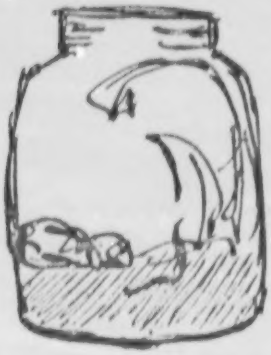
2. BUDS



3. DAFFODILS



4. SOIL



APPENDIX B

VOCABULARY

VOCABULARY

INTEREST AREA: FORSYTHIA

1. Branch
2. Bush
3. Yellow
4. Bloom
5. Plant
6. Spring
7. Bud
8. Young
9. See
10. Develop
11. Early
12. Come

INTEREST AREA: BUD

1. Small
2. Leaf
3. Branch
4. Big
5. Side
6. Red
7. Brown
8. Thorny
9. Season
10. Warm

INTEREST AREA: DAFFODIL

1. Leaves
2. Leaf
3. Blade
4. Stem
5. Flower
6. Roots
7. Sign
8. Blossom
9. New
10. Appear
11. Growth
12. Orange

INTEREST AREA: SOIL

1. New grass
2. Ground
3. Decayed matter
4. Soil
5. Worms
6. Brown
7. Green
8. Earth
9. Loose
10. Grow

APPENDIX C

ACTIVITY SHEETS

NAME ______________________________ DATE ______________

A SMALL GROWTH

I am a new part of a plant.

I could be a new flower or leaf. I am a small growth on the side or tip of a stem.

I am a bud.

1. Where would you find a bud?
2. A bud is big
   small.

ACTIVITY

1. Use your ruler to measure the branch.
2. How long is the branch? _____ inches.
3. Draw a branch with buds.

NAME______________________________ DATE______________

A YELLOW PLANT

I am a yellow plant with bright, yellow, bell-shaped flowers. My flowers come out in early spring.

I am a plant that is a bush.

I am called for-syth'-i-a.

1. What is the name of the yellow plant?____________
2. When does the plant begin to appear?____________

ACTIVITY

1. Make a picture of the forsythia branch with water colors.

NAME________________________________ DATE________________

A YELLOW FLOWER

I am a plant. I have a yellow flower. I have a green stem and green leaves.

I have roots under the soil.

I am a daffodil.

1. What color is a daffodil flower?____________
2. Where are daffodil roots?____________________

ACTIVITY

1. Trace each part of the daffodil.
2. Cut out each part.
3. Paste them together to look like a real daffodil.

NAME________________________________ DATE________________

PART OF THE EARTH

I am part of the earth. Many things grow in me. I have food in me. I am not the same as dirt. But, people use my name to mean dirt. I am soil.

1. Name one thing that grows in soil. ____________
2. Do you find rocks in soil? yes
   no

ACTIVITY

1. Use your dictionary to look up soil.
2. Find another meaning for soil.

APPENDIX D

INTEREST AREA CHECK SHEET

SAMPLE INTEREST AREA CHECK SHEET

INTEREST AREA: ____________________

	Name	Check When Completed	Date
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			
29.			
30.			

APPENDIX E

LEARNING CENTER SUPPLIES FOUND IN INTEREST AREAS

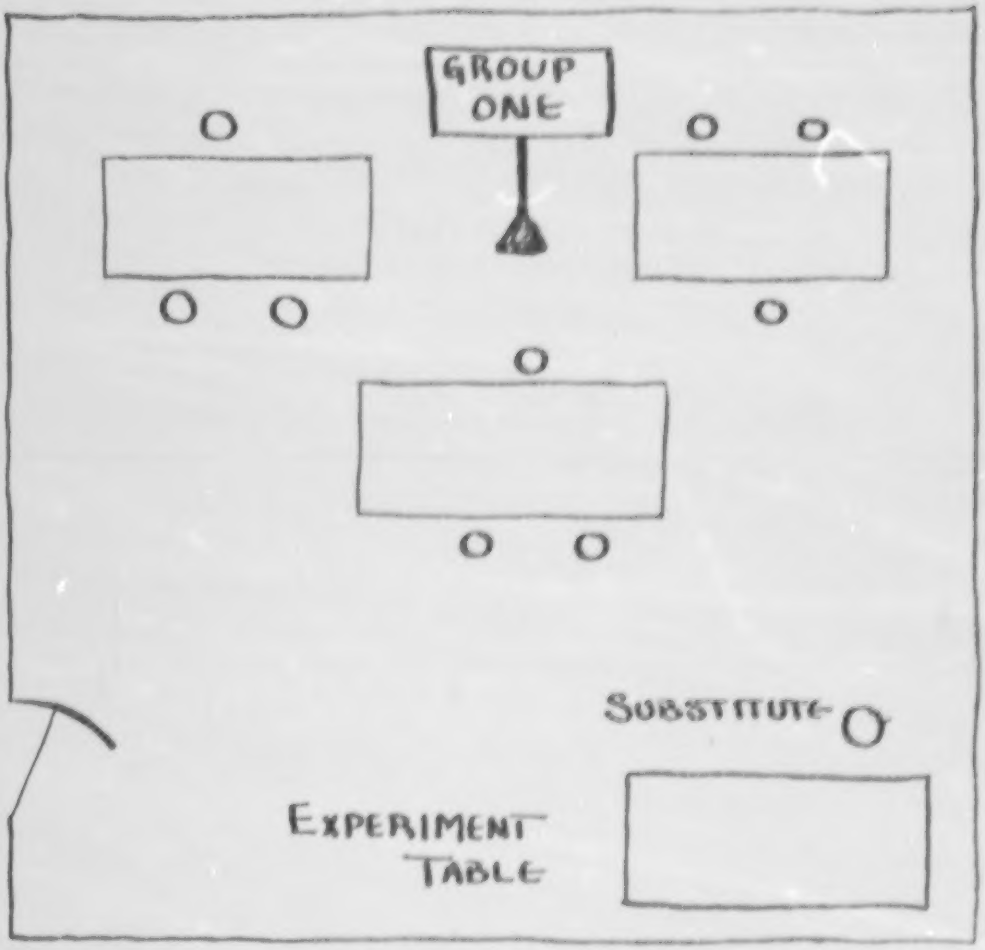
SUPPLIES FOUND IN INTEREST AREAS

1. Manilla drawing paper 8" x 10".
2. White drawing paper 12" x 18".
3. Crayons--black, brown, green.
4. Water colors.
5. Water pans.
6. Water color brushes.
7. Assorted chalk.
8. Clay.
9. Scissors.
10. Coffee cans.
11. Two water buckets.
12. Straight pins.
13. Tacks.
14. Green construction paper.
15. Yellow construction paper.
16. Pencils.
17. Rulers, 1/2".
18. Dictionaries.
19. Rubber cement.
20. Tree branches with buds.
21. Branches from bushes.
22. Soil with new grass.
23. Worms.
24. Decayed matter.
25. Daffodils.
26. Forsythia branches.

APPENDIX F

DIAGRAM OF LEARNING CENTERS

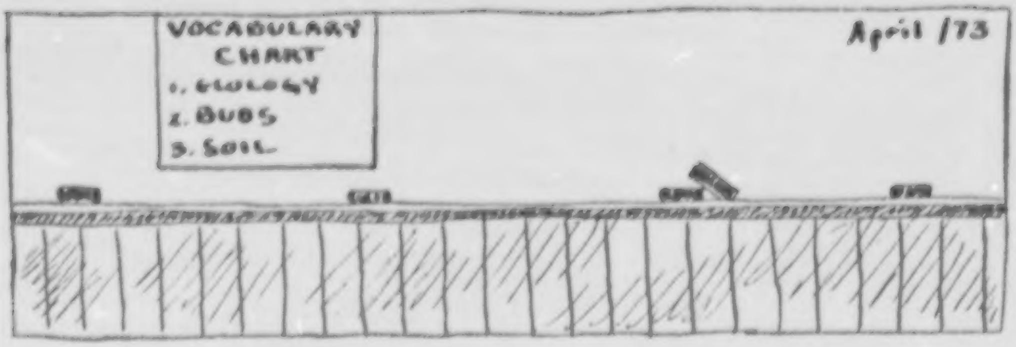
ARRANGEMENT OF LEARNING CENTERS

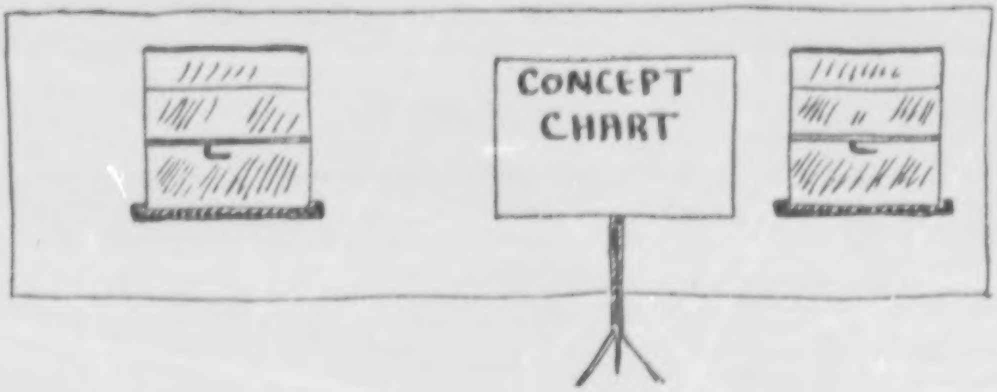

GROUP ONE
SUBSTITUTE
EXPERIMENT TABLE

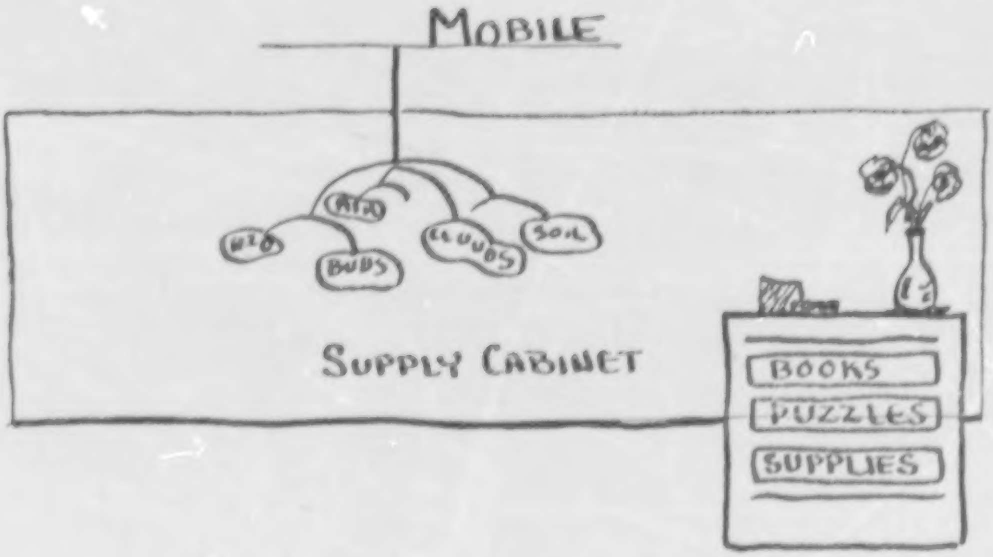
APPENDIX G

DIAGRAM OF CONTENT OF LEARNING CENTERS

CONTENT OF LEARNING CENTERS


VOCABULARY CHART
1. BIOLOGY
2. BUDS
3. SOIL
April /73


CONCEPT CHART


MOBILE
H2O
AIR
BUDS
CLOUDS
SOIL
SUPPLY CABINET
BOOKS
PUZZLES
SUPPLIES

APPENDIX H

CHILDREN'S ROSTERS FOR LEARNING CENTERS

CHILDREN'S ROSTERS FOR LEARNING CENTERS

Group	Centers					
G	1	2	3	4	5	6
L	2	3	4	5	6	1
O	3	4	5	6	1	2
Y	4	5	6	1	2	3
C	5	6	1	2	3	4
E	6	1	2	3	4	5

APPENDIX I

LEARNING CENTER PROGRESS CHART

LEARNING CENTER PROGRESS CHART

	Pupil	Pupil-teacher		Groups	G L O Y C E
1.	Christemma Robert K.	Gladys	G	G1 G2 G3	P R O J E C T
2.	Clifton William	John			T E S T
3.	Bernard Mona	Teresa		G1 G2 G3	
1.	Frank Robert S.	Melisa	L	L1 L2 L3	P R O J E C T
2.	Monica Charlotte	Diane			T E S T
3.	Mary Abbas	Dakota		L1 L2 L3	
1.	Daryl Walter	Andre	O	O1 O2 O3	P R O J E C T
2.	Carla Marcus	James			T E S T
3.	Michelle Cynthia	Florina		O1 O2 O3	
1.	Anthony Jeffery	Ralph	Y	Y1 Y2 Y3	P R O J E C T
2.	Della Dea	Wayne			T E S T
3.	Brian Johnny	Brack		Y1 Y2 Y3	
1.	Andrena Wanda	Dane	C	C1 C2 C3	P R O J E C T
2.	Theodore Marguerite	Michael			T E S T
3.	Conna Robert B.	Terry		C1 C2 C3	
1.	Nathan Randy	Veronica	E	E1 E2 E3 E4	P R O J E C T
2.	Keith Robert Z.	Ervin			T E S T
3.	Lloyd Gerald	Darnell		E1 E2 E3 E4	
4.	Sam Belinda	Lonny			
	SUBSTITUTE TEACHERS				P R O J E C T
		Vivian Celestine			T E S T

APPENDIX J

CULMINATING PROGRAM

CULMINATING PROGRAM FOR LEARNING CENTERS

EXHIBITION--MAY 31, 1973

Seat visitors in learning centers.

GREETING:

Classes sing "What Makes the Weather."

I. Introductions--explanation for each center by a pupil-teacher.

(Child's name) a. Animals.
b. Plants.
c. Sky and water.
d. Weather and air.
e. Earth's crust.
f. Space.

Use teacher-pupil procedure.

II. Demonstration of Projects

Two projects from each center to be reviewed with visitors. Twelve students to speak.

III. Testing

Pass out remaining test for visitors to take in their centers.

Closing: Three speakers

1. A definition of Ecology.
2. Explanation of a natural cycle.
3. Pollution.

Classes recite "Man's Carelessness" (98).

APPENDIX K

EXHIBIT SIGN-UP SHEET

EXHIBIT TIME

COME VISIT THE LEARNING CENTERS

	Time	Class
	1:00-1:45 p.m.	
Thursday May 31, 1973		
	2:00-2:45 p.m.	

Two classes per time period

Room 105

APPENDIX L

MATERIALS AND SUPPLIES FOR LEARNING CENTERS

MATERIALS AND SUPPLIES FOR LEARNING CENTERS

Wax paper
Balloons
Planters
Soil
Seeds (assorted)
Water
Water cans
Flower pots
Newspaper
Water buckets
Paint clothes
Rulers
Pointers
Poster board
Construction paper (assorted colors)
Waste baskets
Envelopes
Plastic trays
Plants
Sea shells
Filmstrip projector
Extension cord
Sand
Scissors
Tacks
Straight pins
Gold fish and snails
Hermit tree crabs
Rocks
Sand
Charcoal bits
Plastic bags (various sizes) and fasteners
3" x 5" cards
Crayons
Cardboard boxes
Paint brushes
Easels
Supply trucks
Cactus plants
Sweet potatoes
Globe
Tin foil
Rubber cement
Orange chalk
Experience charts
Ditto sheets

Glass jars

Pebbles

Paper towels

Shoe boxes

Black tempra paint

Aquariums

Artificial water plants

Food for animals

Green squares

Round blue circles

Terrarium sample

Pencils

Ecology stamp and stamp pad

Magic slates

Charts

Peat moss

Tomato plants

Library books

Posters

Mobiles

Picture puzzle

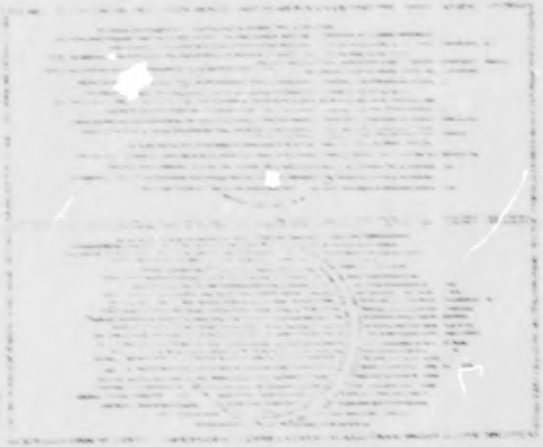
Word puzzles

APPENDIX M

EXTRA WORKSHEETS

The Moon

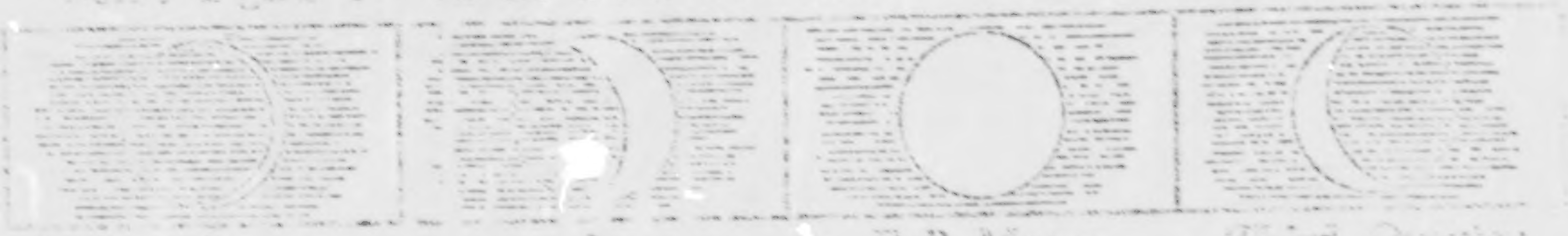
We cannot always see the moon. The moon moves around the earth so we can see it only part of the time.



When we do not see the moon on a clear night, we say it is the dark of the moon.

When we begin to see the moon, we see a crescent moon. Sometimes we call it a new moon, but it is not really new.

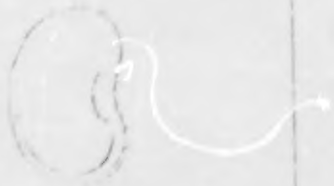
Some nights the moon looks like this:

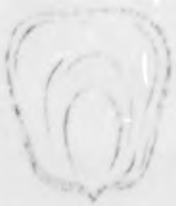


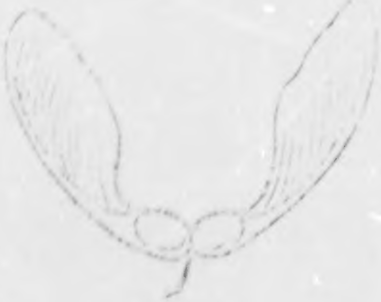
New Moon First Quarter Full Moon Third Quarter

Some calendars tell when the moon will be crescent, first quarter, or half, full, or third quarter. Find out what nights it will be this month. Try to look at the sky then and observe the moon.

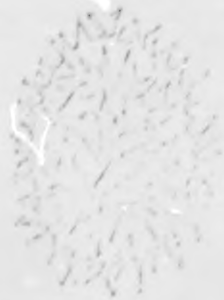
KINDS OF SEEDS


Lima Bean


Corn

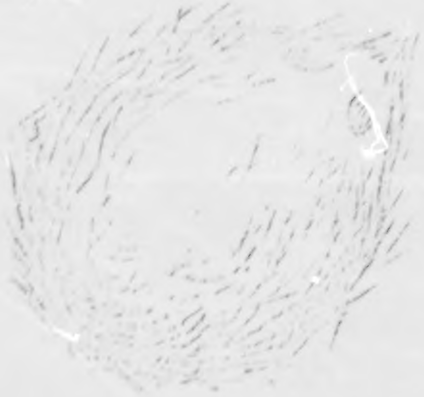

Maple

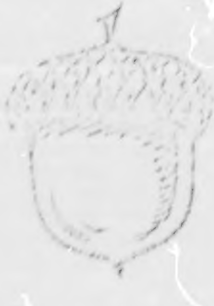
Dandelion


Cocklebur

Sunflower

Grass

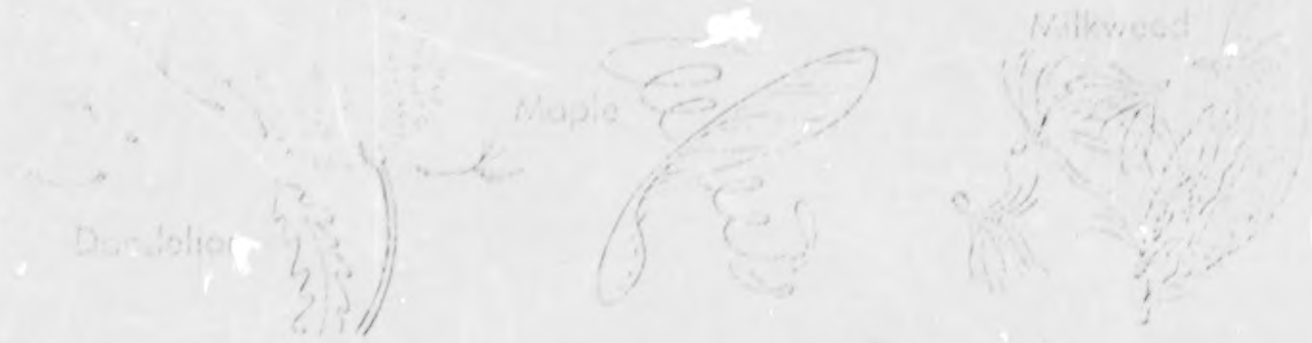

Coconut


Acorn

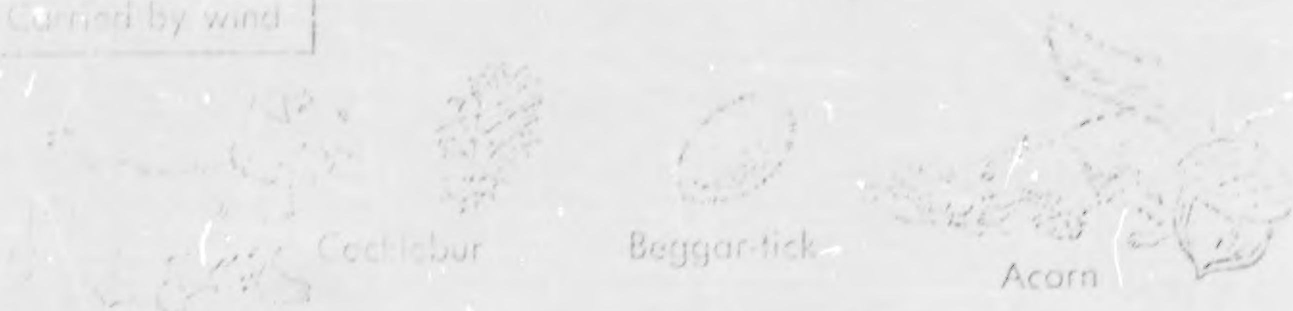
PUPIL ACTIVITIES

1. Name two kinds of seeds we eat ______________________
2. Name two kinds of seeds that come from trees______________________
3. Circle the seed that is covered with sharp, little hooks.
4. Color the seeds you have seen.

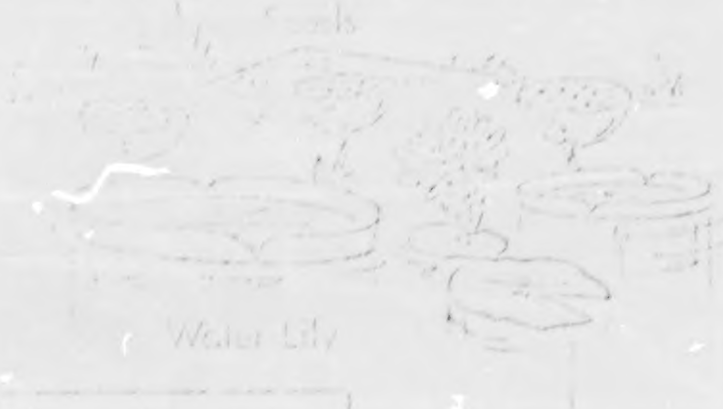
HOW SEEDS TRAVEL

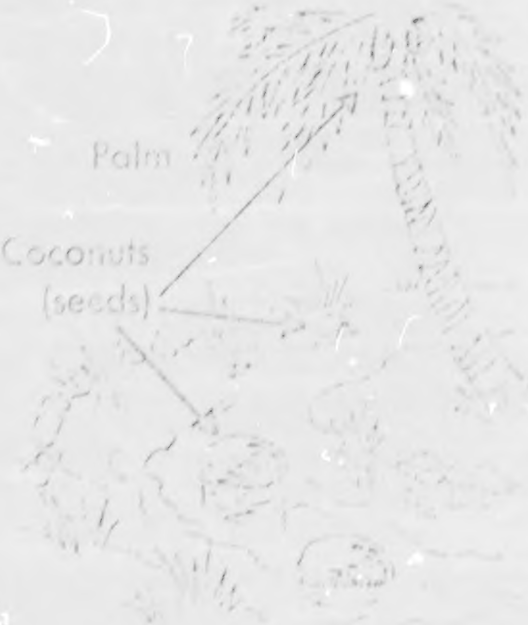

Dandelion
Maple
Milkweed

Carried by wind


Cocklebur
Beggar-tick
Acorn

Carried by animals and man


Seeds
Water Lily


Palm
Coconuts
(seeds)

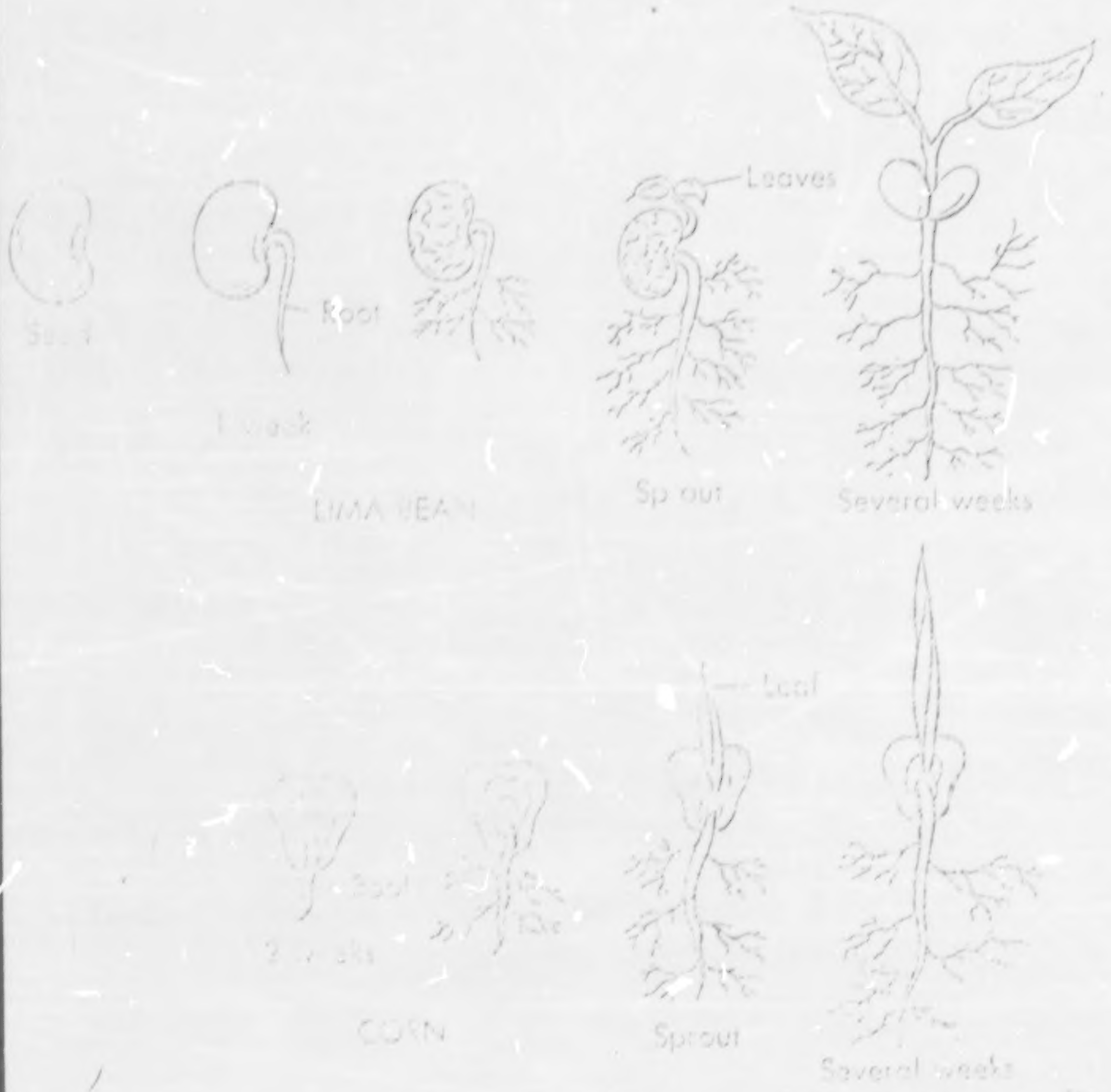
Carried by water

PUPIL ACTIVITIES

1. Circle the seeds that might stick to your sweater.
2. Draw a line under the seeds that have wings.
3. Name one kind of plant with seeds that float on water ____________

[illegible] the seeds that you have seen.

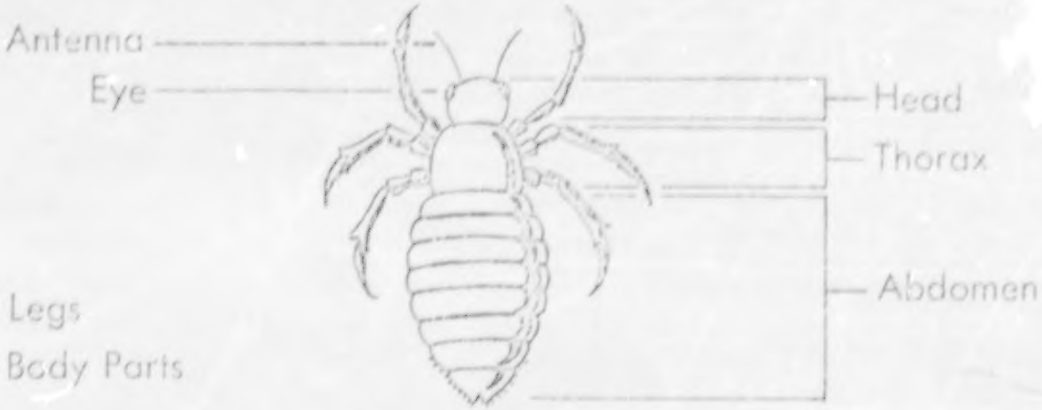
PLANT GROWTH AND CHANGE


Seed
Root
1 week
Leaves
Sprout
Several weeks
LIMA BEAN
Leaf
Root
2 weeks
Root
CORN
Sprout
Several weeks

PUPIL ACTIVITIES

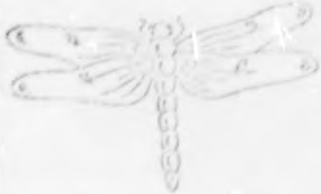
[illegible] a picture where the root is first seen.
[illegible] under the picture where the leaves are first seen.
[illegible] of the plant that takes water from the soil is called the [illegible]
[illegible] seeds into the young plants.

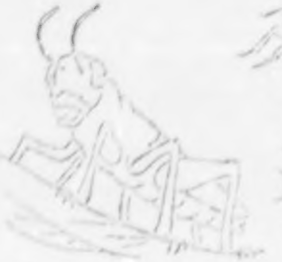
INSECTS AND SPIDERS

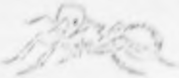


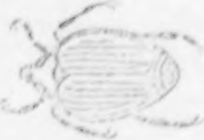
6 Legs
3 Body Parts

An Insect

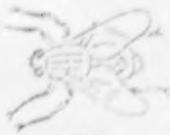

Dragonfly

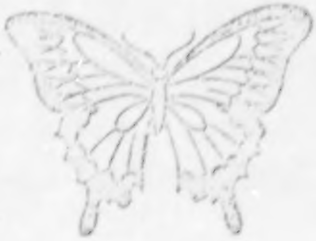

Grasshopper


Ant

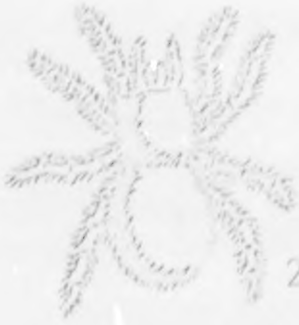

Beetle

Bee


Fly

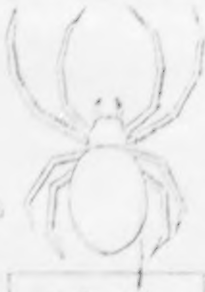

Butterfly

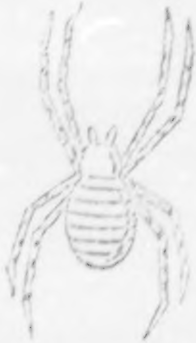
Kinds of Insects


Tarantula

8 Legs

2 Body Parts


A Spider


Garden Spider

PUPIL ACTIVITIES

1. An insect has ________ legs. A spider has ________ legs.
2. Circle your answer: On what part of the insect's body are the legs joined? Head. Thorax. Abdomen.
3. Underline the insect that makes honey.
4. Color the insects and spiders you have seen.

Camel

Chimpanzee

Hippopotamus

PUPIL ACTIVITIES

Circle the [illegible] that belong to the cat family.

[illegible]

[illegible] in [illegible]

[illegible]

ANIMAL PETS

Dog

Fish

Snake

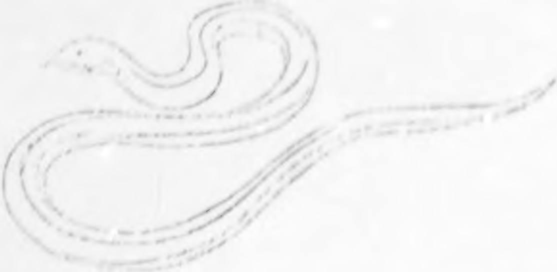
Hamster

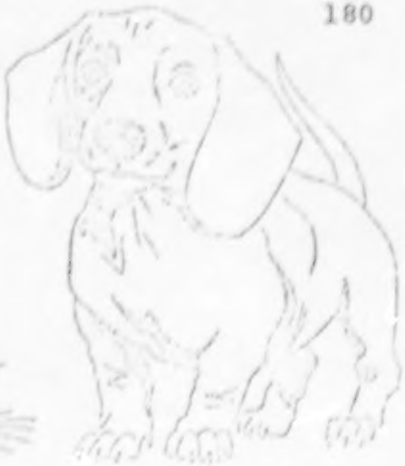
Rabbit

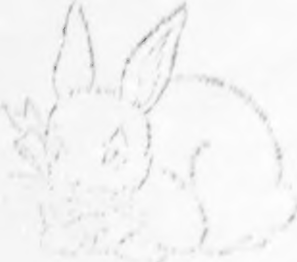
Cat

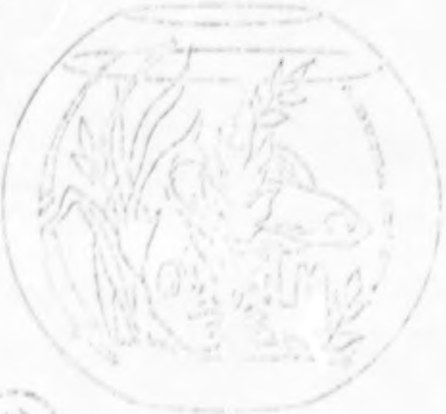
[illegible]

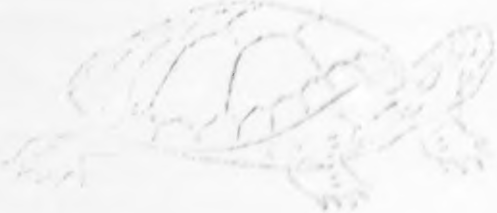
Turtle

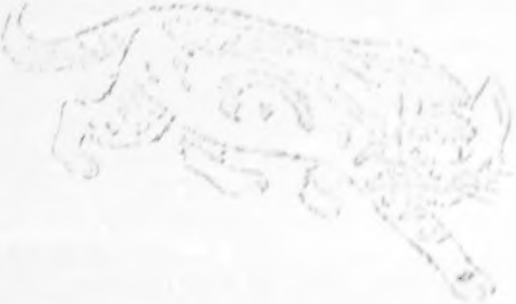


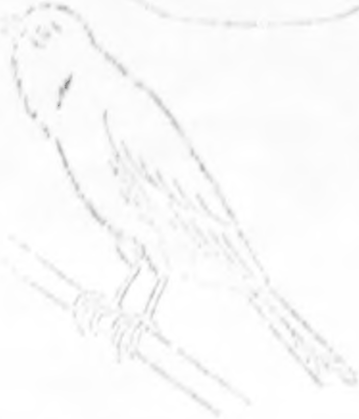












PUPIL ACTIVITIES

1. Draw a line and match the word with the picture.
2. Circle the pet that has a hard shell on its back.
3. Put a line under the pet that lives in water.
4. Color all the animal pets.

FARM ANIMALS

Cow
Turkey
Horse
Sheep
Chicken
Pig

PUPIL ACTIVITIES

1. Draw a line under the animal that gives us wool.
2. Circle the animal that [illegible] eggs.
3. Put an X by the animal that [illegible]
4. Color the animals in the picture.

HOW ANIMALS MOVE

Animals move by using their legs, wings and other parts of their bod

Legs
Wings
Other parts of body

PUPIL ACTIVITIES

1. To show how animals move, draw a line from the word [illegible]
2. Draw a circle around the animal that uses fins to [illegible] the animal that you [illegible]
3. [illegible] to move? Yes No
4. [illegible]

Starfish
Snails and Clams
Crayfish
Insects
Spiders
Animals Without A Backbone
Amphibians
Reptiles
Birds
Mammals
Animals With A Backbone

PUPIL ACTIVITIES

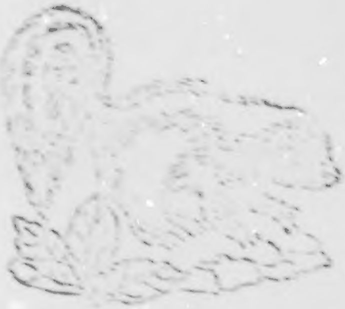
[illegible] animals without a backbone that live [illegible]

[illegible]

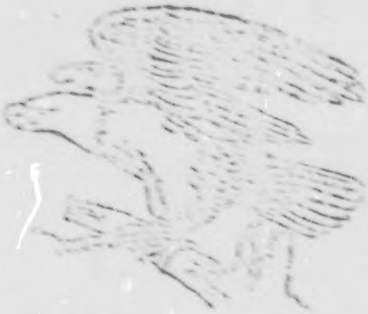
Draw a line under all [illegible] that have legs.

[illegible]

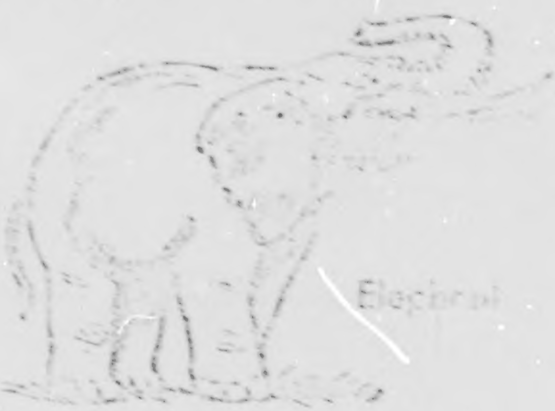
ANIMALS ON LAND



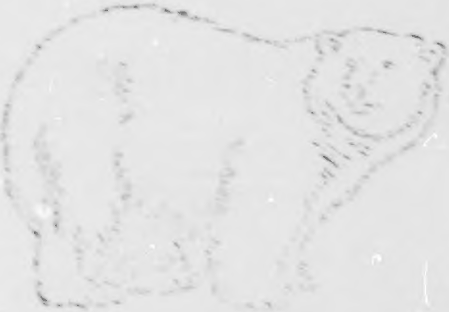
Skunk



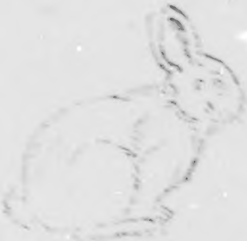
Eagle



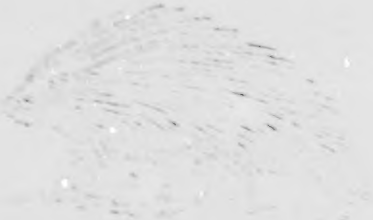
Elephant



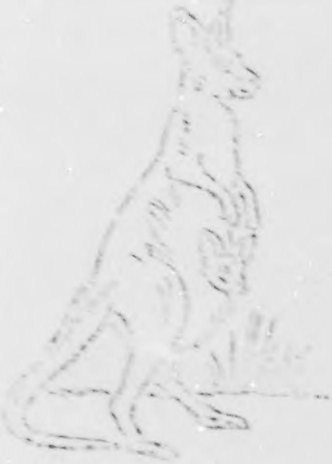
Bear



Rabbit



Porcupine



Kangaroo

Mouse

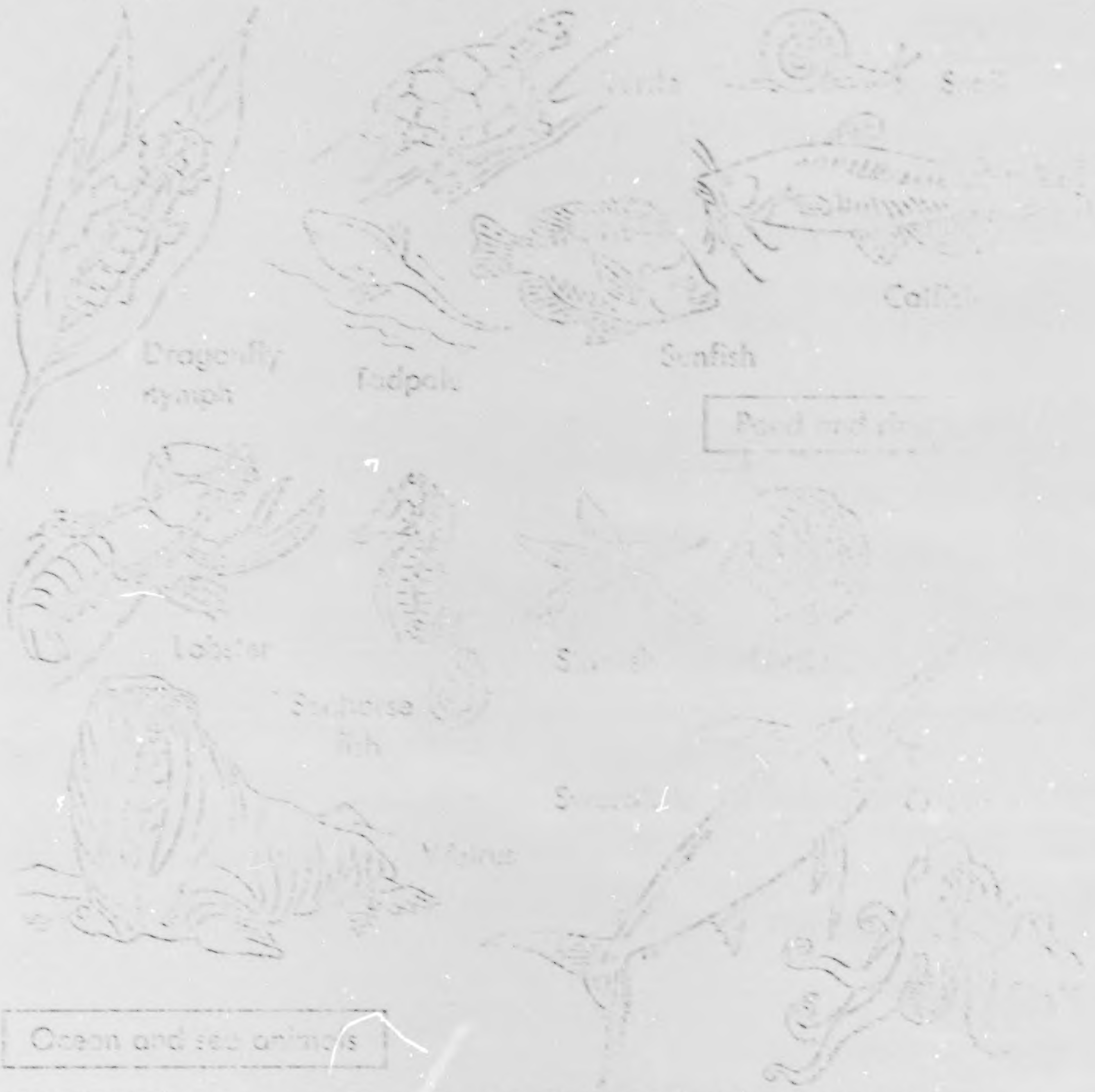
Snake

Deer

PUPIL ACTIVITIES

1. Circle the biggest animal that lives on land.
2. Put a line under the animal that carries its babies in a pouch.
3. Circle your answer: A porcupine has a stripe down its back and tail. Yes. No.
4. Color all the animals.

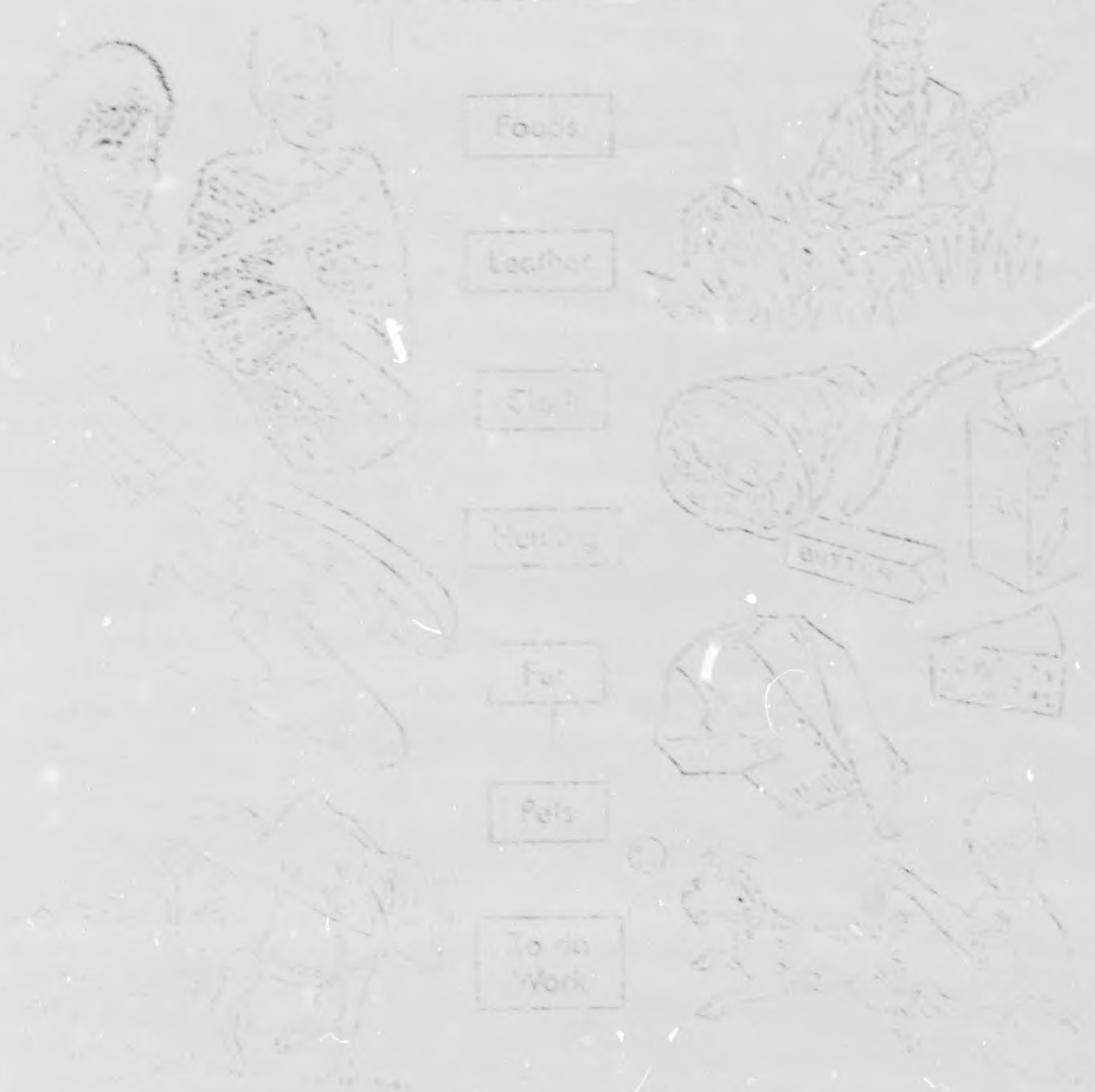
ANIMALS THAT LIVE IN WATER


Turtle
Snail
Catfish
Dragonfly nymph
Tadpole
Sunfish
Pond and river
Lobster
Starfish
Sea horse fish
Walrus
Octopus
Ocean and sea animals

UNIT ACTIVITIES

1. Draw a line under all the animals that have a shell.
2. Circle your answer: How many arms does an octopus have? 6, 7, 8, 9
3. Circle the pond animal that will become a frog.
4. Color the animals that you might see at the shore.

WE USE ANIMALS


Foods
Leather
Cloth
Hunting
Fur
BUTTER
Pets
To do Work

PUPIL ACTIVITIES

[illegible] by drawing a line [illegible]
to [illegible]

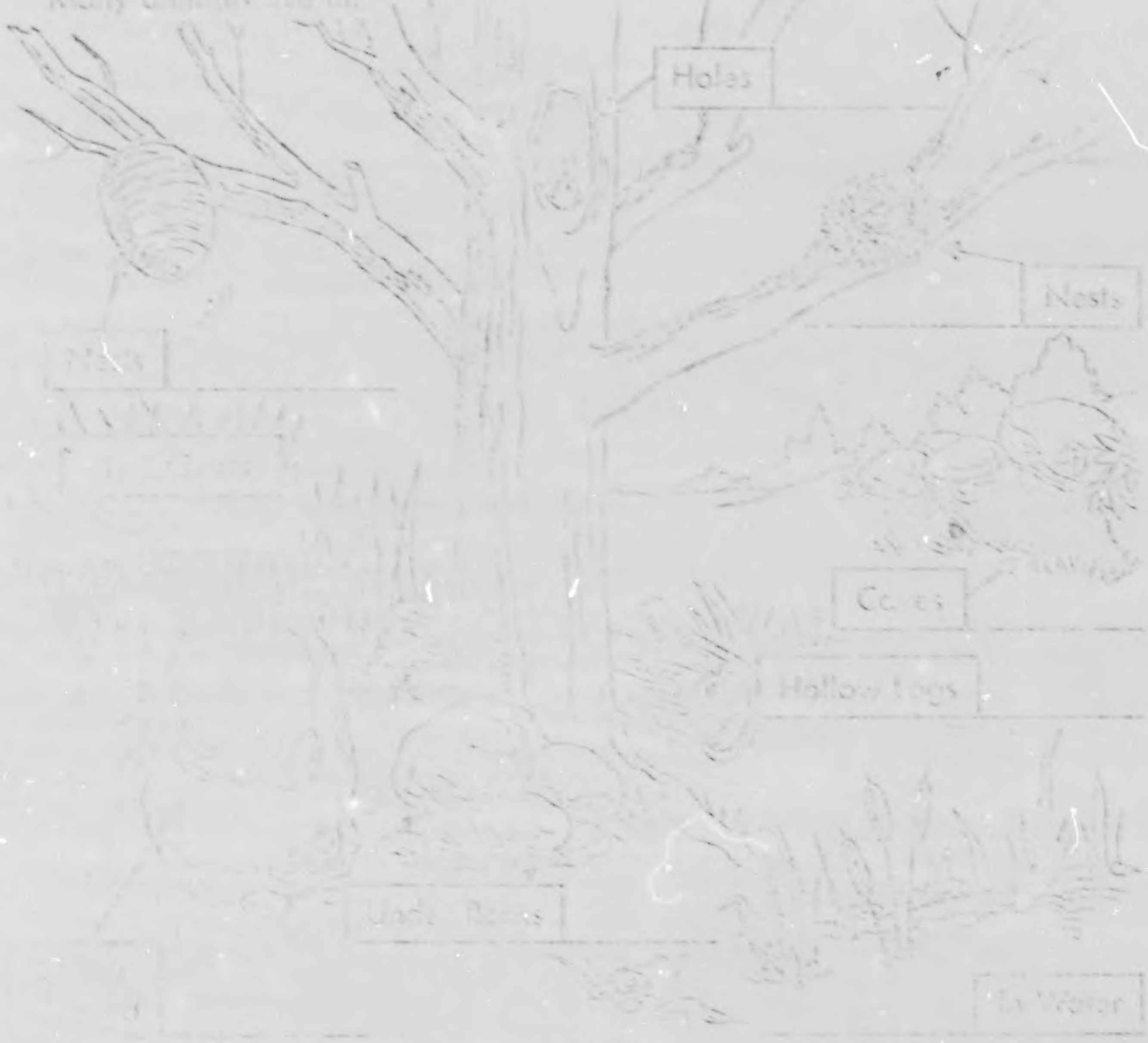
[illegible]

[illegible]

Color the pictures.

ANIMAL HOMES

Many animals live in:


Holes
Nests
Nests
Caves
Hollow Logs
Under Rocks
In Water

Squirrel, Fish, Wasp, Robin, Ant, Bird, Fox, Snake

MORE ACTIVITIES

1. [illegible] the name of an animal [illegible]. [illegible]
[illegible]
2. Circle your answers. A ground hog lives under the ground. Yes No
3. Color all the animal homes.

APPENDIX N

ECOLOGY STAMP

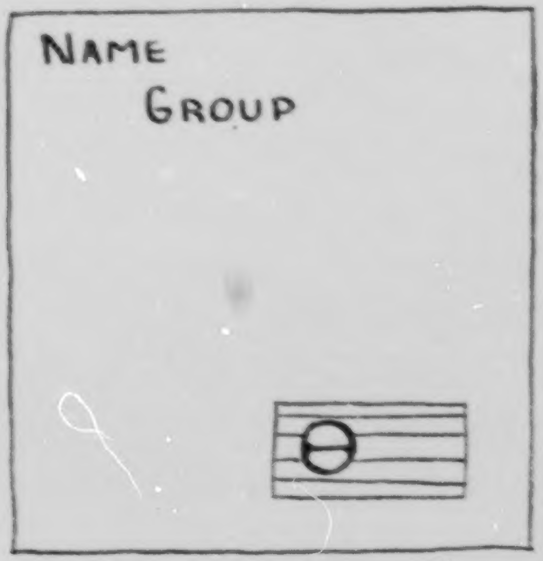
ECOLOGY STAMP

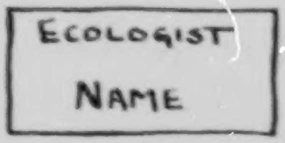
Ecology stamp teachers had made to motivate and to mark tests:

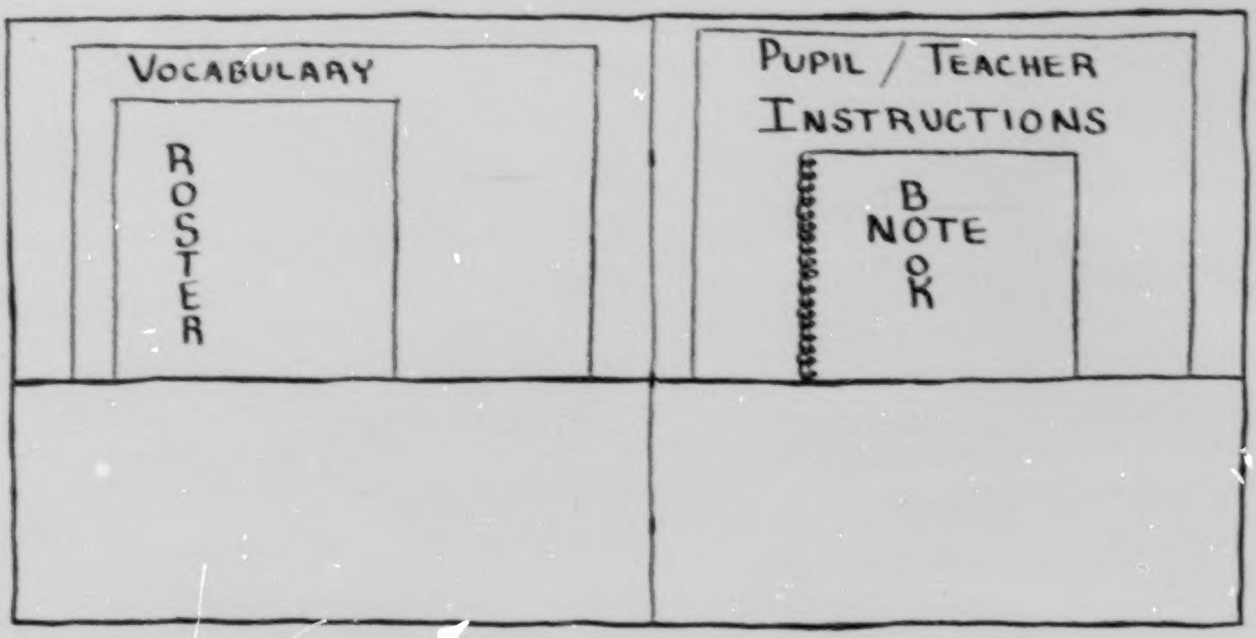
APPENDIX O

ECOLOGY KITS AND CONTENTS

ECOLOGY KITS




ECOLOGIST
NAME

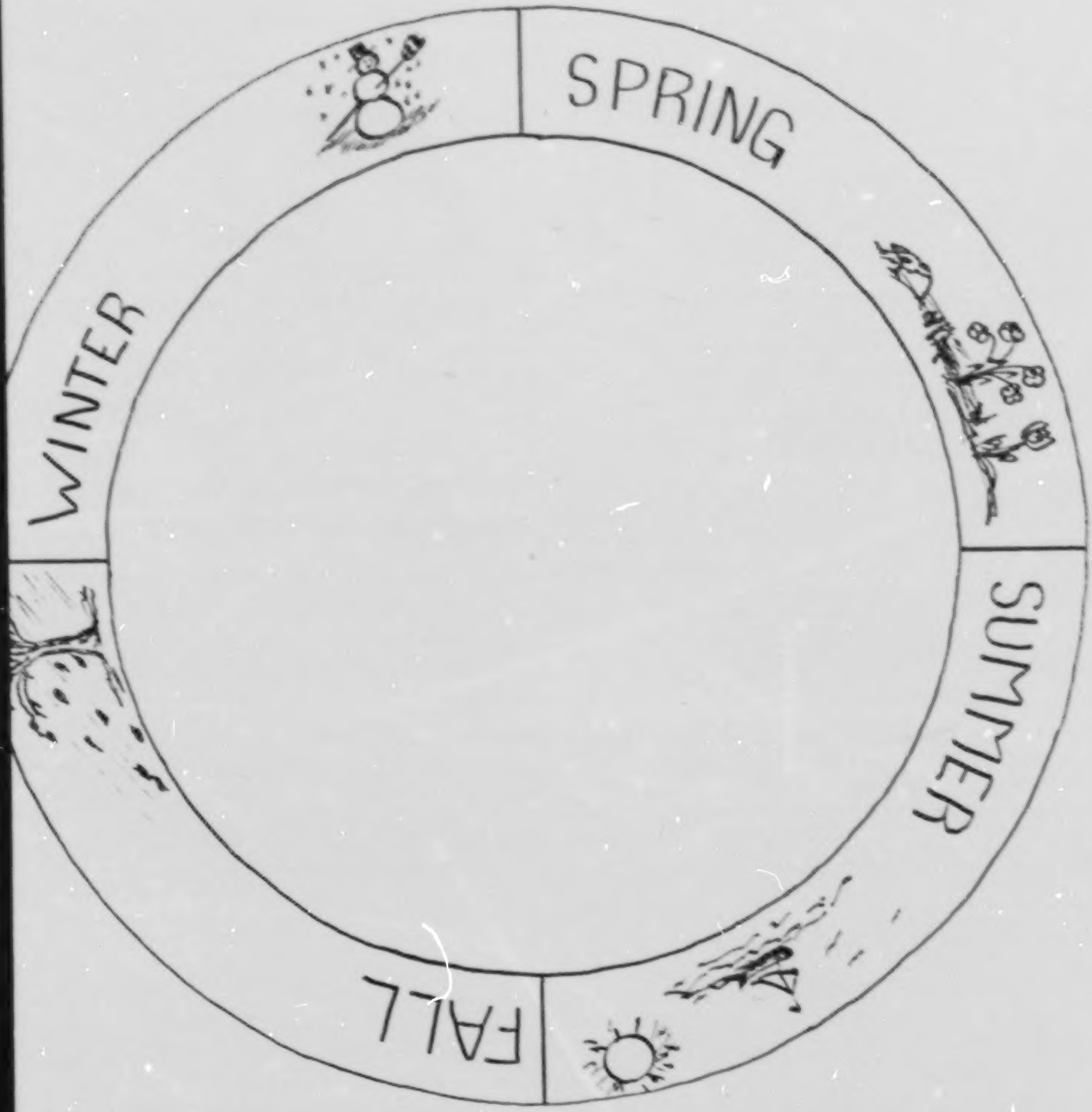

VOCABULARY
ROSTER
PUPIL / TEACHER
INSTRUCTIONS
NOTE
BOOK

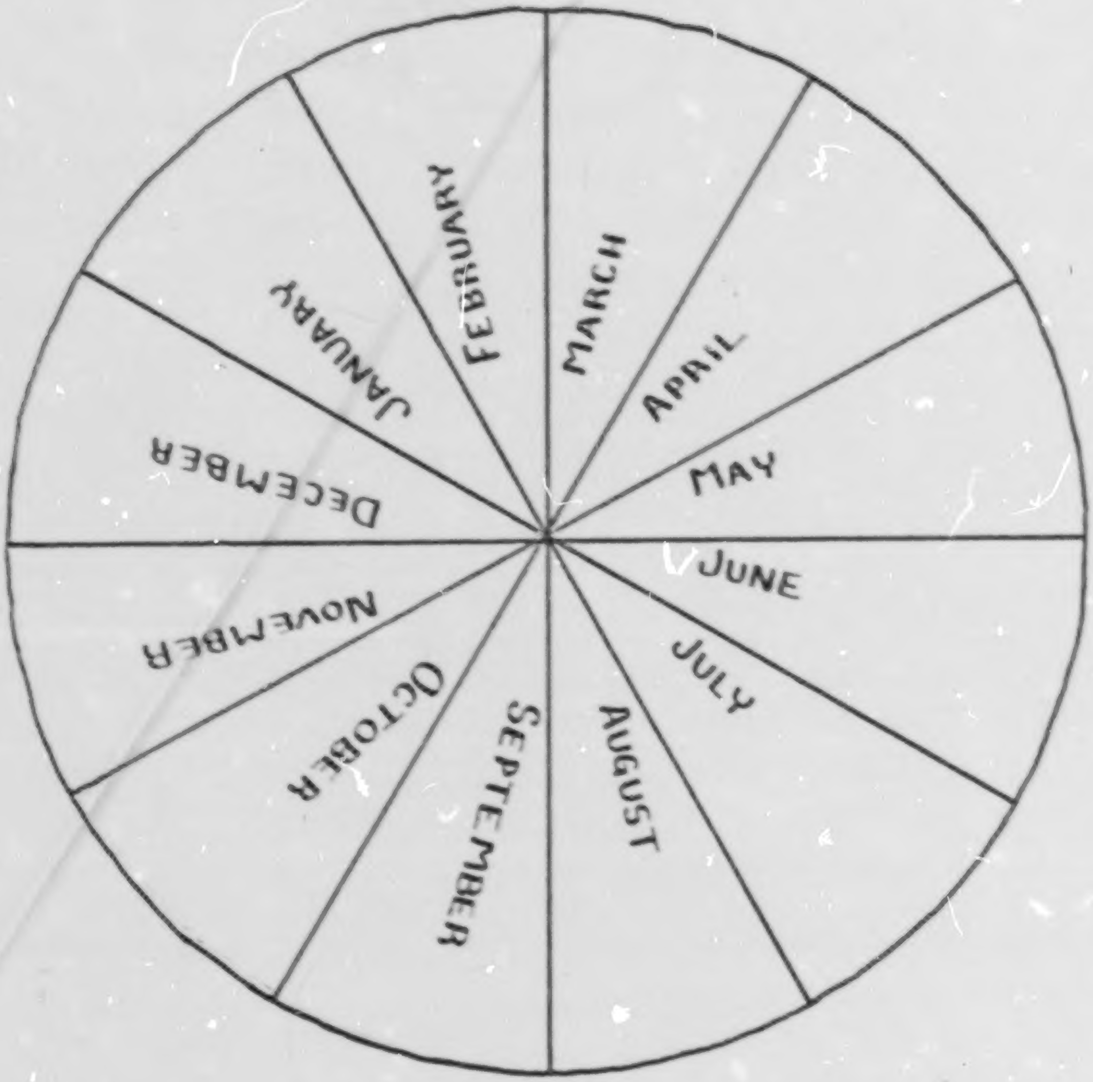
CONTENTS OF ECOLOGIST'S KIT

1. A two-pocket folder.
2. Notebook.
    a. Name and group letter.
    b. Vocabulary flash cards and envelope.
    c. Season cycles.
    d. A basic ecology vocabulary list and their meanings.
    e. Roster.
    f. Center procedure.
    g. Teacher-made quizer for each learning area.
    h. Teacher-developed notes from teacher demonstration lessons.
    i. Test on ecology unit.

APPENDIX P

SEASON CYCLE WHEEL


SPRING
SUMMER
FALL
WINTER


JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER

APPENDIX Q

ECOLOGY WORD GAME

ECOLOGY WORD GAME

Instructions:

1. Ecology words were placed on desks. (The words were in triplicate; this way more than one group might have the word.)
2. The teacher read a definition.
3. The group with the definition was to stand.
4. The group must first agree that they had the correct word; if they all stood with the proper word, the group received a point.
5. The group with the most points at the end of the time won.

Note: No group received a point if someone remained sitting after the group stood.

No group received a point for the incorrect word.

No group received a point if they were told they had the correct word by another group.

APPENDIX R

"THE ECOWIZARD"

"THE ECOWIZARD"

Once upon a time, not too long ago, about a month or two ago, in a little old school in the heart of a city--namely Philadelphia--there were two teachers who were interested in doing something new with their children.

So, one day the first grade teacher said to the third grade teacher, "Let's do a unit on Ecology with our children." The third grade teacher said, "We can certainly try it. But let's call on an Ecowizard to give us a hand."

Well, boys and girls, do you know the Ecowizard was so happy and excited over the idea that he said, "I will transform all your children from 1:15 to 2:45 into Ecologists, everyday, until the unit is completed."

He then "Bazhoomed" up an Ecology Kit and an Ecologist name tag for each one of you.

The Ecowizard disappeared and he said all we had to do was call on him if we got into any difficulty.

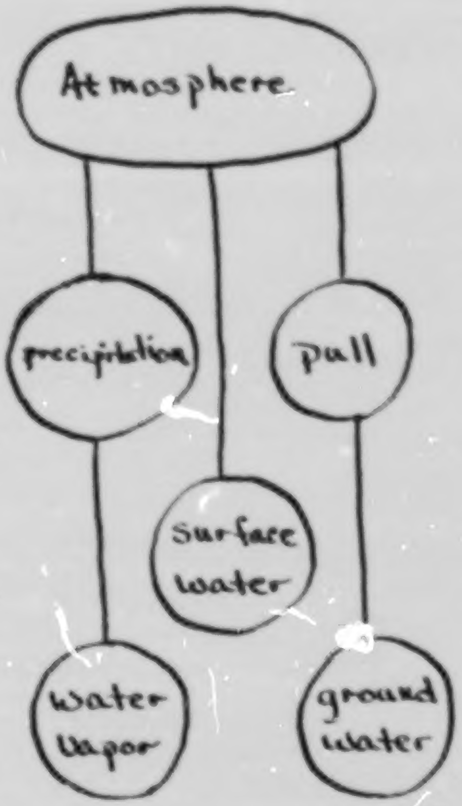
THE END

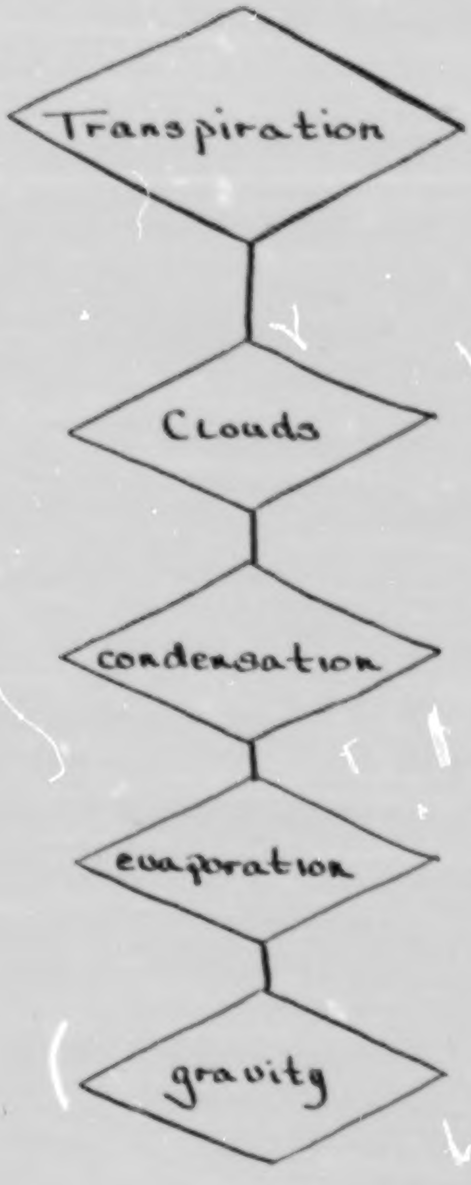
APPENDIX S

LESSON ILLUSTRATIONS

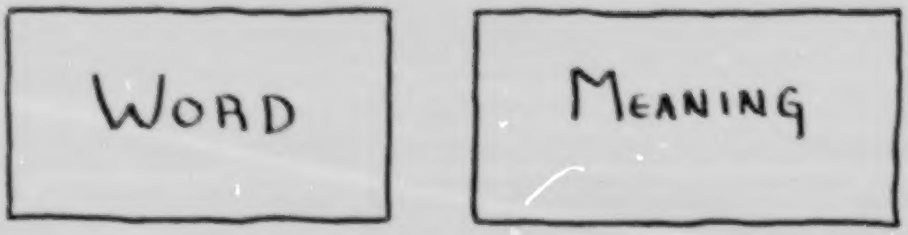
WATER CYCLE VOCABULARY ILLUSTRATED

1. LEAD MOBILES:

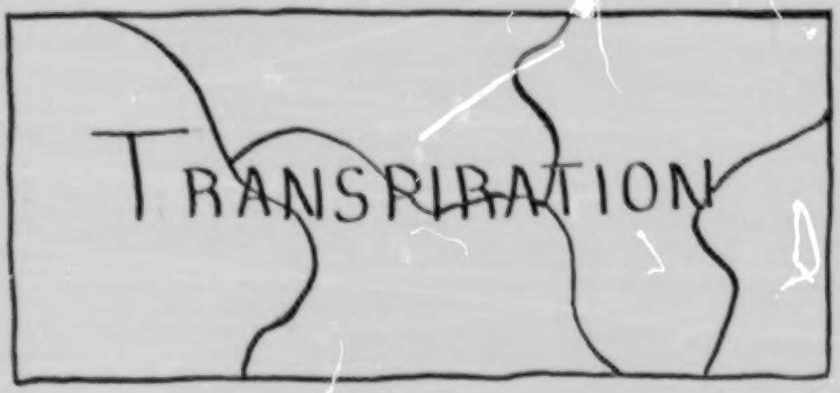

Atmosphere
precipitation
pull
surface water
water vapor
ground water


Transpiration
Clouds
condensation
evaporation
gravity

2. Flash Cards:


WORD
MEANING

3. Word Puzzles:


TRANSPIRATION

4. ACTIVITY SHEETS:

#1

NAME DATE

1. Go over these words with your pupil-teacher:
   - A. clouds
   - B. surface water
   - C. atmosphere
   - D. rain

2. Use your crayons to show a picture using all the words above.

#2

NAME DATE

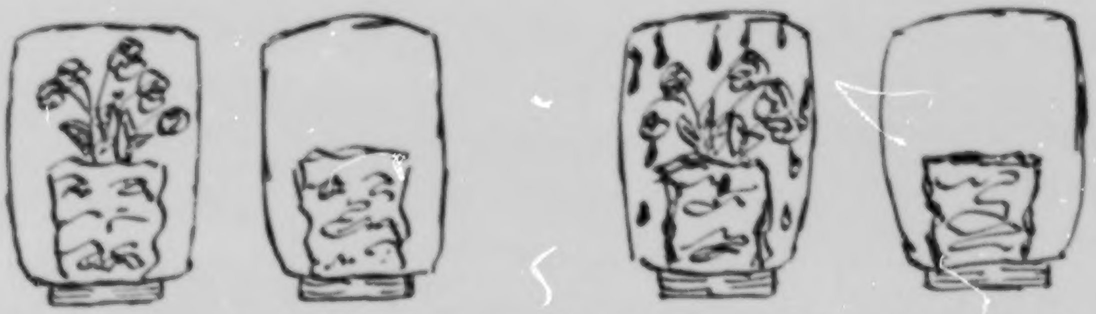
1. Divide these words into syllables:
   - A. atmosphere
   - B. precipitation
   - C. pull
   - D. surface water
   - E. water vapor
   - F. ground water
   - G. transpiration
   - H. clouds
   - I. condensation
   - J. evaporation
   - K. gravity

WATER CYCLE EXPERIMENTS

#1 Get a potted plant and water it. Wrap the pot and soil with aluminum foil. Wrap the foil tightly around the stem. Cover the plant with a large glass jar.

Wrap another pot that has moist soil but no plant. Cover this pot with a jar, too.

In a few days, look at the jars. In which jar is there a film of water along the sides?



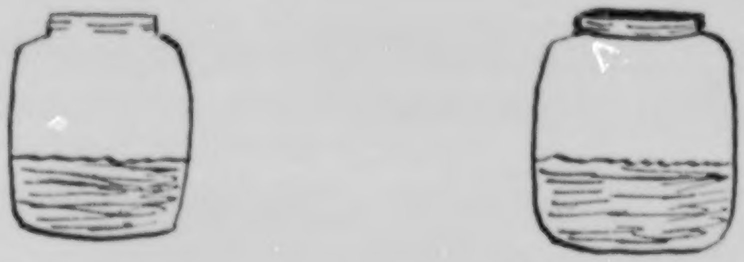
#2 ALLOW two jars of water identical size and amount to sit for two or three days.

Observe:

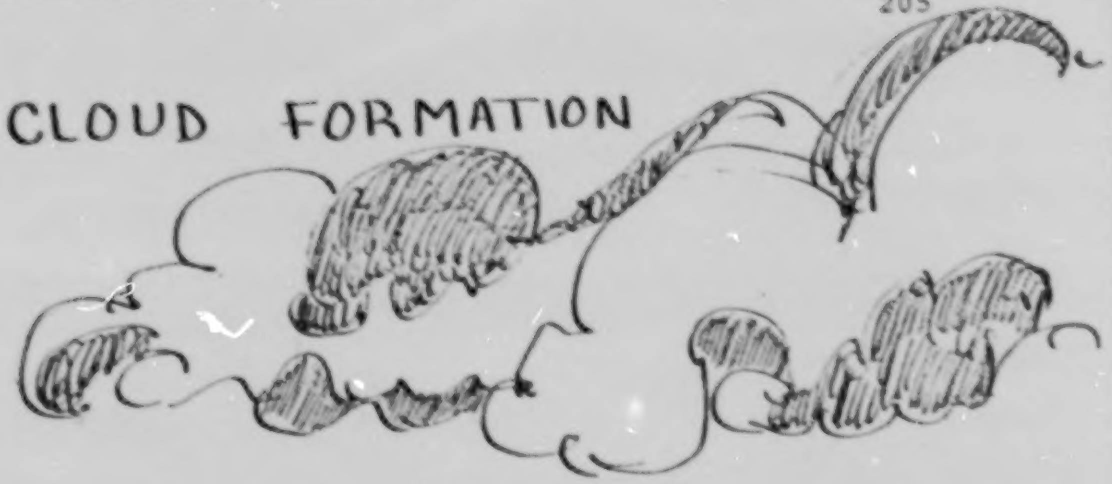
one jar has a lid.

one jar is without a lid.

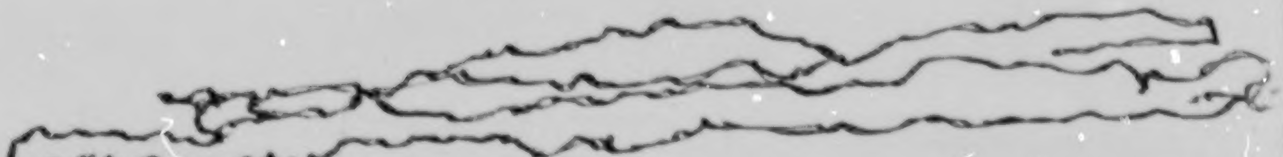
What happens to the water in each jar?



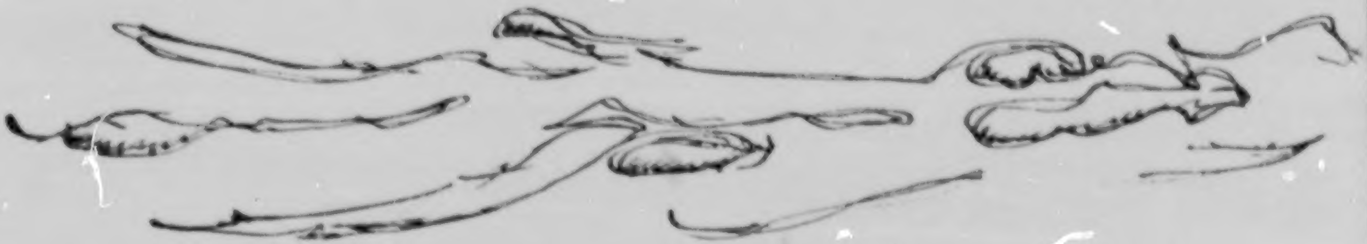
CLOUD FORMATION



CUMULUS



STRATUS



CIRRUS

WATER CYCLE WORD PUZZLE GAME

Use word puzzles to go over the water cycle words:

1. Have each group of ten children perform as a team.
2. Pass out one word puzzle to each team.
3. The first group with their puzzle together yells, "Watercycle."
4. The puzzle is checked. If the puzzle is correct they receive one point and a new word puzzle.
5. The first team with five points wins the Water Cycle Game.

DEFINITION HUNT GAME

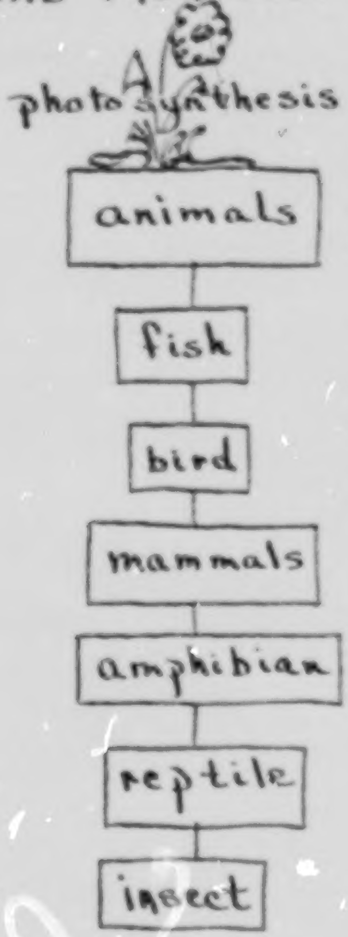
Definitions were scrambled on the floor, desks, and tables.

The game was as follows:

1. Each pupil-teacher received the word for his group.
2. They had five minutes to think of the correct definition. The child who was certain he knew the correct one was selected to do the finding.
3. At the end of the five-minute group discussions, a whistle was blown.
4. The child selected could begin to look.
5. No group could score more than three points.
6. Hopefully, as the words changed the child doing the hunting would change. The first group with three points was the winner.

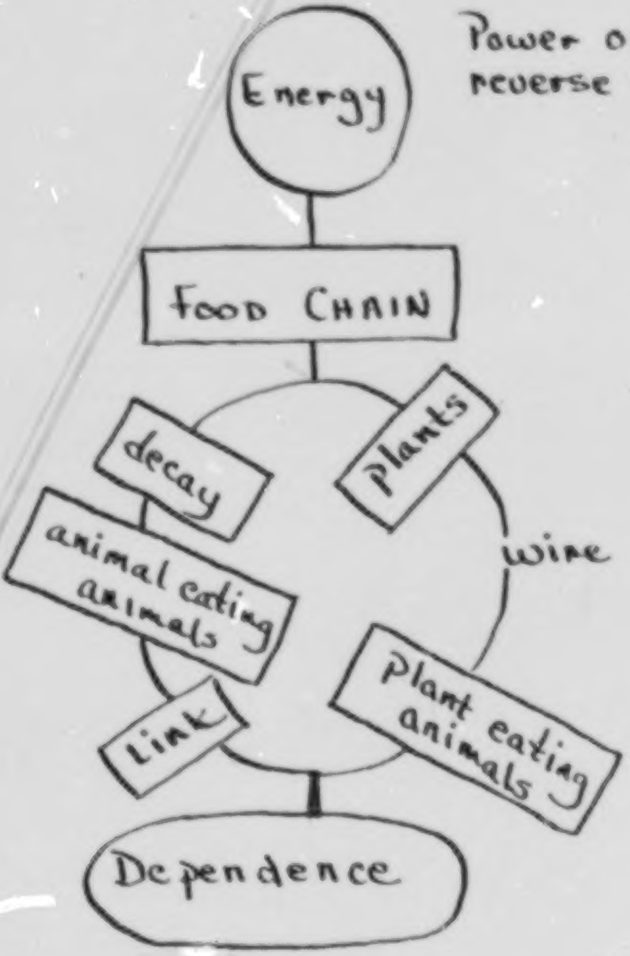
FOOD CHAIN CYCLE VOCABULARY ILLUSTRATED

1. LEAD MOBILES:


photosynthesis
animals
fish
bird
mammals
amphibian
reptile
insect

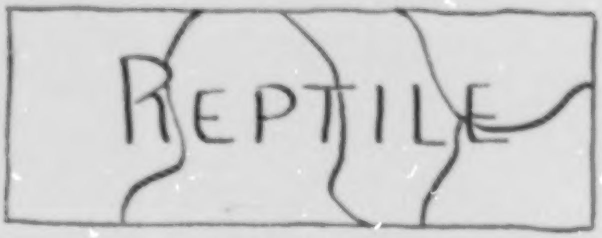
habitat + 3 animals on reverse side

picture on one side word on the other


Energy
FOOD CHAIN
plants
decay
wire
animal eating animals
plant eating animals
link
Dependence

Power on reverse side

2. WORD PUZZLES:



3. BINGO GAME: Directions at the end of food chain cycle vocabulary illustrations.

F	O_1	O_2	D	C
insect	bacteria	fish	link	protection
predator	plant eating animals	FREE	mammal	food chain
animal eating animal	decay	plants	habitat	adaptation
animal	reptile	bird	amphibian	dependence

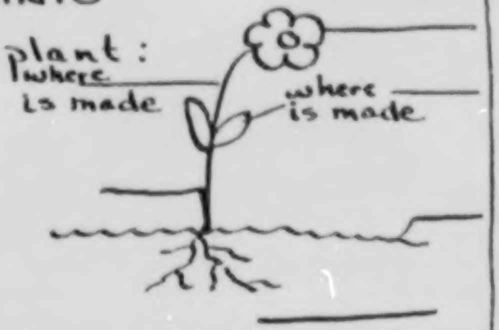
4. Activity Sheets:

#1 this sheet was stapled in the notebooks for reference.

NAME DATE

PLANTS

The parts of a plant:



In order to be healthy, a plant needs these in its enviornment:

1.
2.
3.
4.
5.

#2 information for this sheet was found in the rooms on the mobiles.

NAME DATE

Fill in the missing letters from the mobiles.

1. e_ _r_y
2. d_c_y
3. f_s_
4. p_an_s
5. a_im_ls
6. i_s_ct_
7. ani_ _ _ e_ting a_im_ls
8. m_m_ls
9. f_od c_a_n
10. p_ot_s_nth_si_
11. _ink
12. h_bi_a_
13. b_rd_
14. dep_ _d_n_e
15. am_hi_ia_s
16. re_t_les
17. p_an_ e_ting an_m_ls

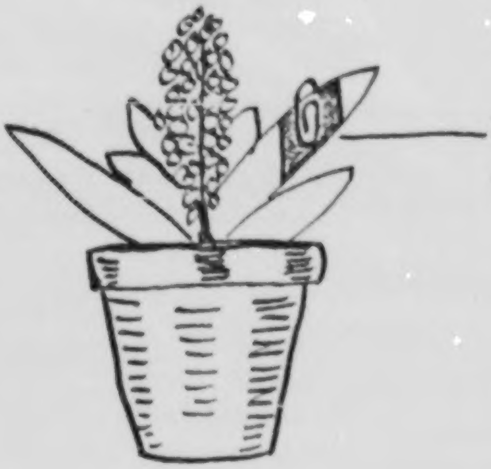
FOOD CHAIN CYCLE EXPERIMENT ILLUSTRATED

#1. Children were given soil, peat pots and seeds to perform the following experiment.

EXPERIMENT CHART

EXPERIMENT: Do plants grow if they do not have:			DID GROW	DID NOT GROW
1. AIR	1. put the plants in a plastic bag.	1.		
	1. do not give the plant any water.	2.		
2. WATER	2. give the plant too much water.	3.		
3. LIGHT	1. put the plant in a dark place.	4.		
4. WARMTH	1. put the plant in a cold place.	5.		
5. GOOD SOIL	1. put the plant in poor soil.	6.		
	2. put the plant in sand.	7.		
Put two plants where they will have air, water, light, warmth and good soil.		8.		
		9.		

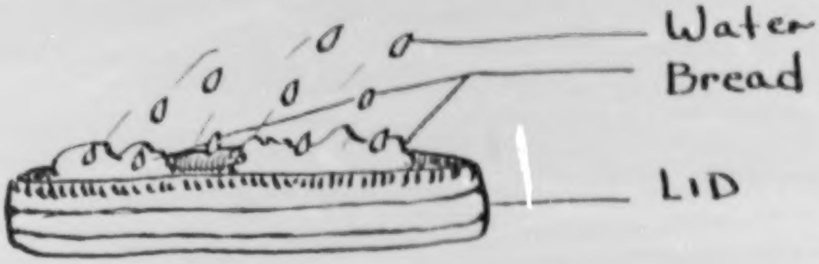
#2. In order to show photosynthesis an opaque piece of paper was clipped to a section on the leaf of a hyacinth plant:

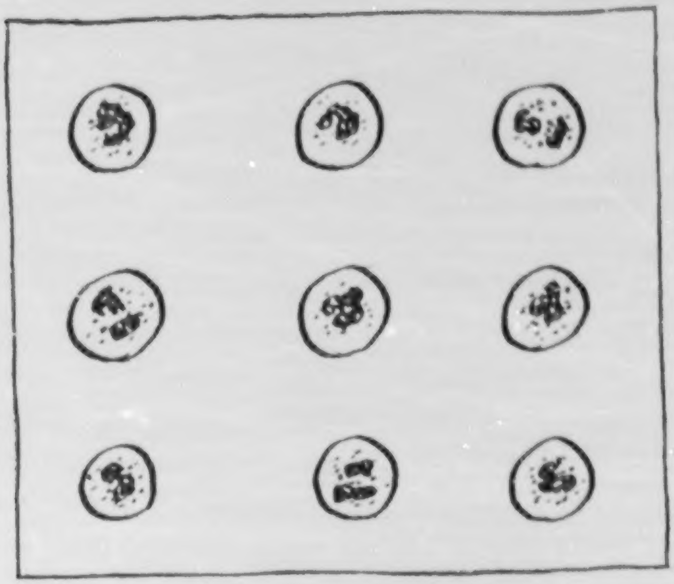

opaque paper clipped to leaf.

After a period of a week the section of leaf turned yellow.

After the experiment the plant was dug up to show how it grew from a bulb.

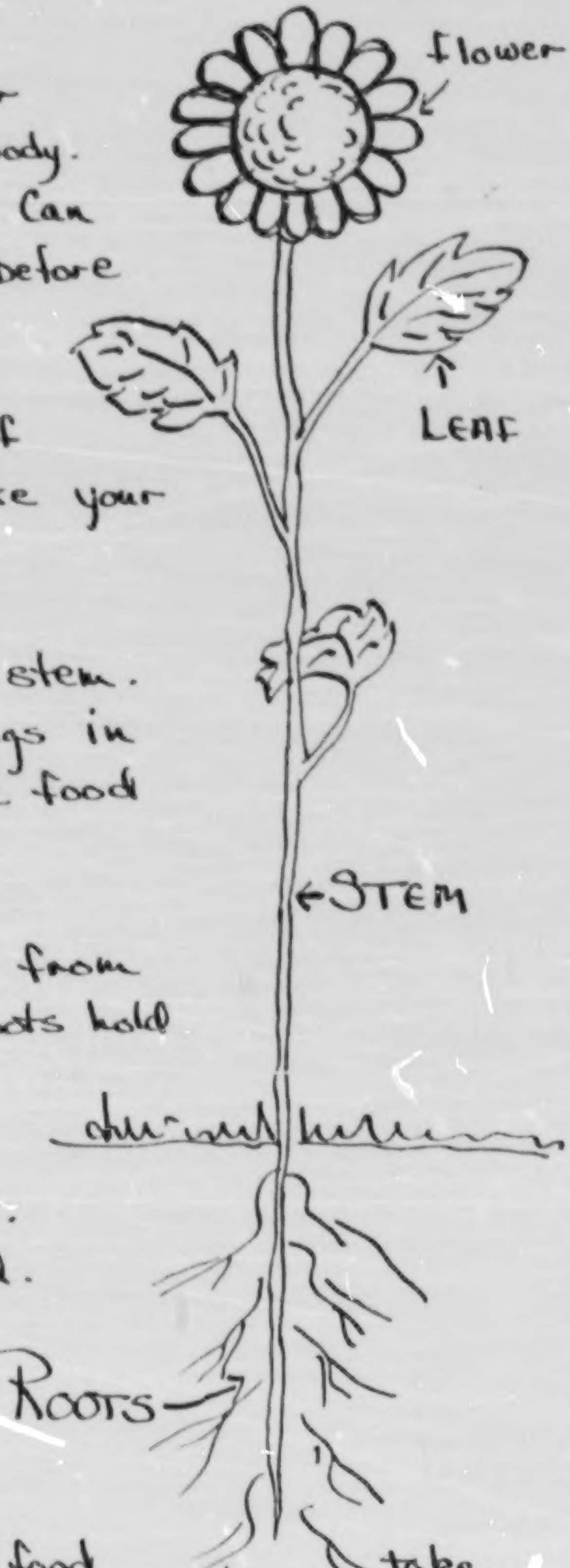
#3. To get across the idea of decay, each group of children was given a jar lid lined with construction paper and bread. Each lid was sprinkled with water. The tray was placed in a warm dark place in order for mold to grow.





Students' tray of individual Experiments.

A PLANT HAS PARTS



Where is your head? Touch your
g. These are both parts of your body.
plant has parts to its body, too. Can
ou name the parts of a plant before
eading the rest of this page.

The part that holds the rest of
e plant is the stem. It is like your
ack bone

Green leaves grow out from the stem.
lants breath through tiny openings in
e leaves. The leaves also make food
or the plant.

The plant gets water and food from
e soil through its roots. The roots hold
in place, too.

The flower is a part of a plant.
efore it opens, a flower is a bud.
hen the flower dies, what
kes its place? What are they
sed for?

Draw the path that water and food take
om the roots to the leaves. What happens to a plant if the
ots are cut?

BINGO GAME

A Bingo Game was developed using the vocabulary from the Food Chain Cycle.

The children were divided into nine groups. Each group had one bingo card and worked on it together.

The cards had five letters, one at the top of each column (see page 209 for sample). Each square under the letters contained an answer to a definition. The definitions were read in order, alternating the letter each time around. If the group had the letter and word to match the definition, they should place a one-inch square over the word in the correct column. When all the squares in a row were filled (across or down) the group called out "Food Chain."

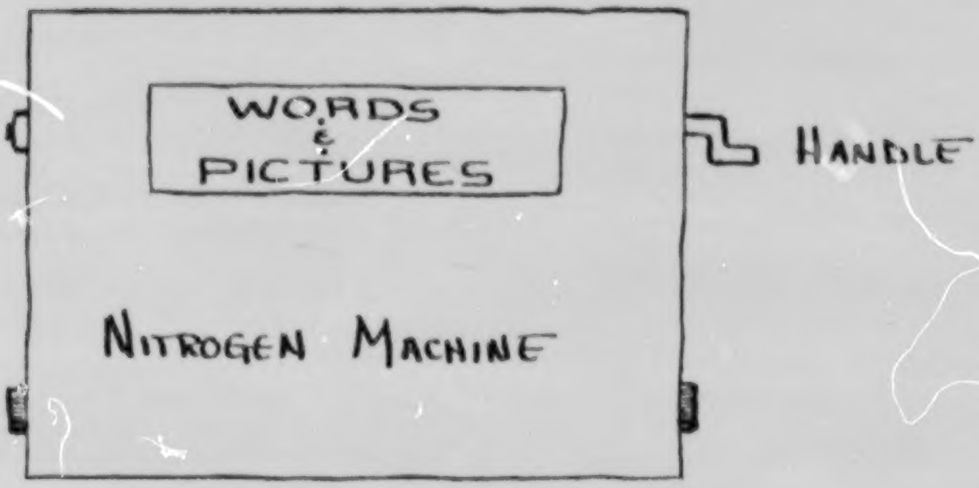
Example: First time around use the first letter; second time around use the second letter; third time around use the third letter; fourth time around use the fourth letter; and fifth time around use the fifth letter, etc.

Letter	Definition	Square Covered
F O_1 O_2 D C	The way in which organisms in an ecosystem feed on each other . .	Food chain
O_1 O_2 D C F	The way an organism keeps from getting hurt or eaten	Protection

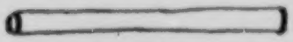
Letter	Definition	Square Covered
O_2 D C F O_1	One part of a chain	Link
D C F O_1 O_2	An organism who lives by eating other organisms	Predator
C F O_1 O_2 D	Needing another organism to live	Dependence
F O_1 O_2 D C	Any part of an organism that changes to better live in its environment	Adaptation
O_1 O_2 D C F	To rot	Decay
O_2 D C F O_1	An organism that helps things decay or rot	Bacteria
D C F O_1 O_2	Where an organism lives	Habitat
C F O_1 O_2 D	An animal with fins, scales and lives in the water	Fish
F O_1 O_2 D C	An animal with six legs and three parts to its body . . .	Insect
O_1 O_2 D C F	An animal that lives on land and in the water	Amphibian
O_2 D C F O_1	An animal with hair on its body and feeds its babies milk	Mammal
D C F O_1 O_2	An animal having scaley skin, lungs, and breathes air . . .	Reptile
C F O_1 O_2 D	An animal that has feathers on its body, lungs, and breathes air	Bird
F O_1 O_2 D C	A green organism with flower, stem, leaves, and roots . . .	Plants
O_1 O_2 D C F	An organism that could be an insect, mammal, reptile, bird, fish, or amphibian . . .	Animal

Letter	Definition	Square Covered
O_2 D C F O_1	An animal that eats plants . . .	Plant-eating animal
D C F O_1 O_2	An animal that eats animals . .	Animal-eating animal
C F O_1 O_2 D	Making its own food through the leaves from the sun . . .	Photosynthesis

NITROGEN MACHINE
(TACHISTOSCOPE)

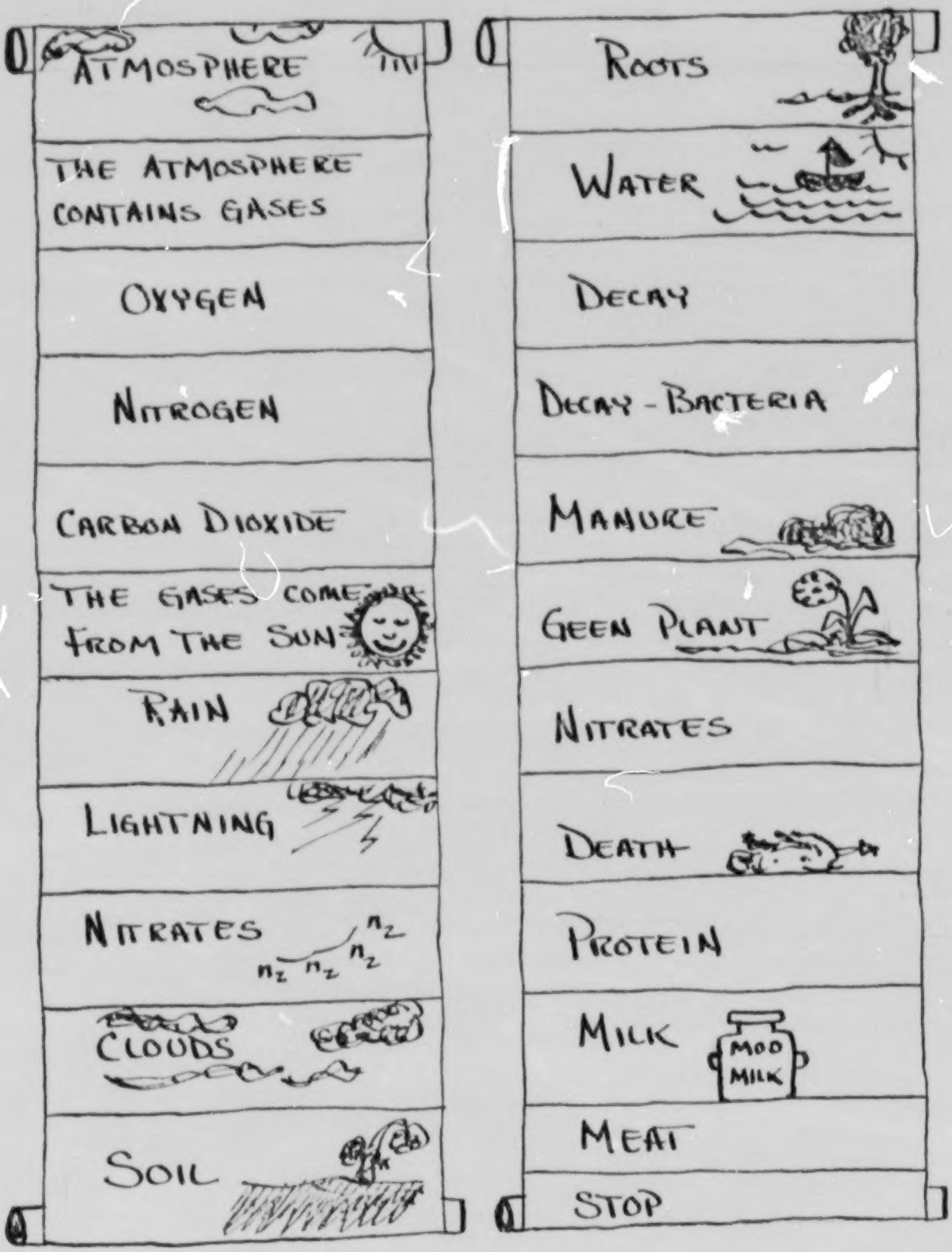

WORDS
&
PICTURES
NITROGEN MACHINE
HANDLE

1. CARDBOARD BOX... (PORTABLE T.V. -21")
2. CARDBOARD TUBE FROM CHRISTMAS WRAPPING PAPER.



3. ROLL OF PAPER TO FIT TUBE.
4. CONSTRUCTO KIT FOR KNOBS AND HANDLES.
5. PEN, INK AND TAPE.

TACHISTOSCOPE ROLLS CONTAINED:

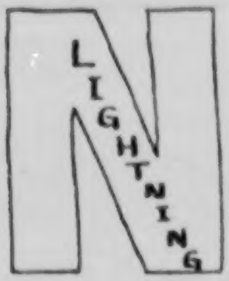


- ATMOSPHERE
- THE ATMOSPHERE CONTAINS GASES
- OXYGEN
- NITROGEN
- CARBON DIOXIDE
- THE GASES COME FROM THE SUN
- RAIN
- LIGHTNING
- NITRATES
- CLOUDS
- SOIL

- ROOTS
- WATER
- DECAY
- DECAY - BACTERIA
- MANURE
- GEEN PLANT
- NITRATES
- DEATH
- PROTEIN
- MILK
- MEAT
- STOP

NITROGEN CYCLE VOCABULARY ILLUSTRATED

#1 FLASH CARDS:

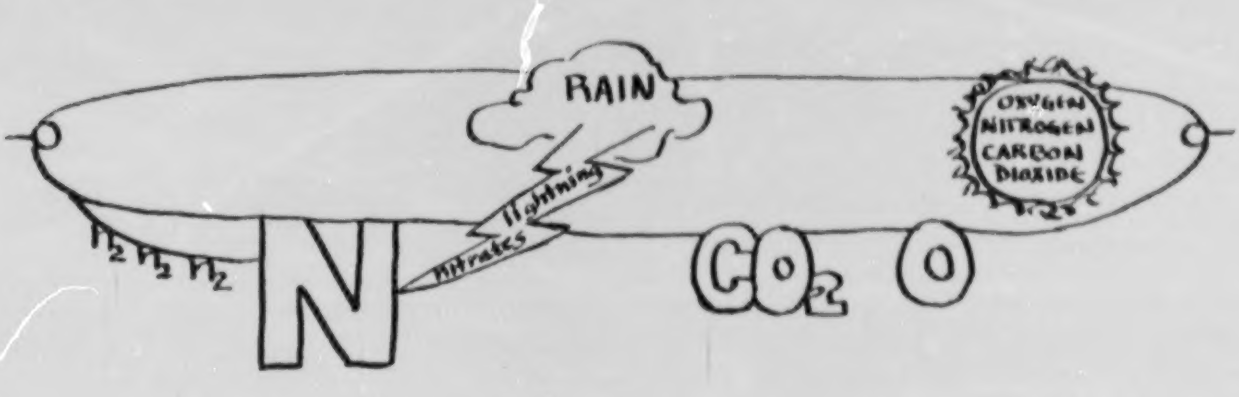

N
LIGHTNING

A FLASH OF
ELECTRICITY
IN THE SKY

WORD MEANING

#2 A. ATMOSPHERE

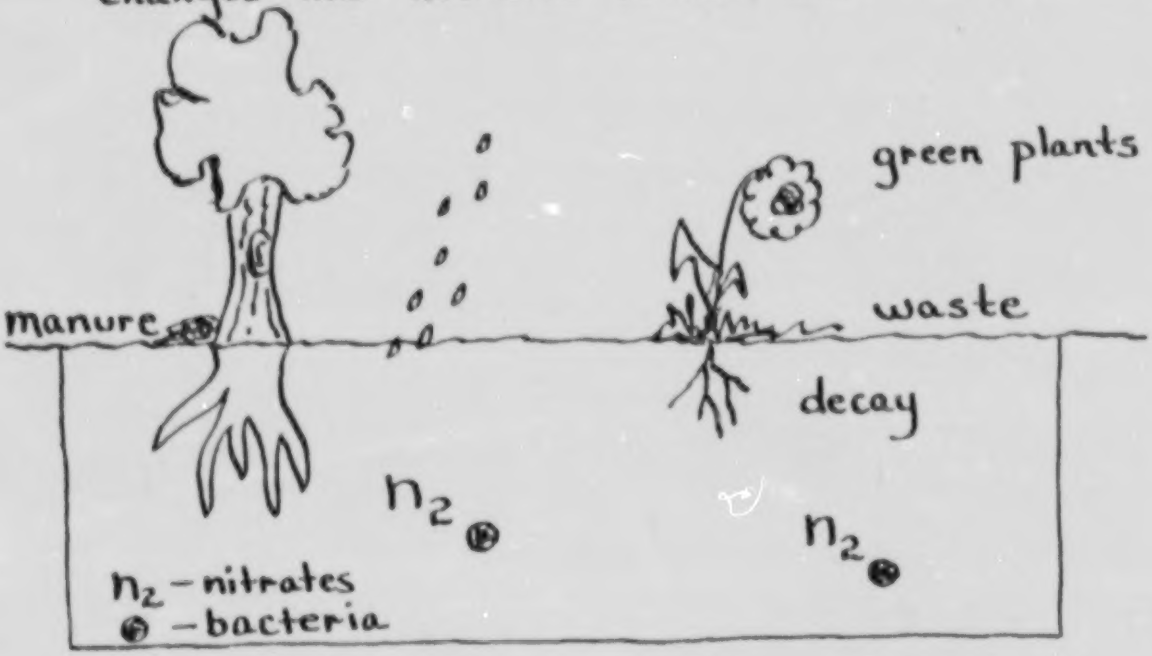
Vocabulary was illustrated on a pully line across the classroom. The purpose was to simulate the atmosphere and further demonstrate how nitrogen, when struck by lightning, changes into nitrates.


RAIN
OXYGEN
NITROGEN
CARBON
DIOXIDE
lightning
nitrates
N_2 N_2 N_2
N
CO_2
O

All of this was made in miniature for the children.

B. SOIL

Vocabulary was illustrated on a bulletin board. This was to demonstrate how nitrogen changes into nitrates in the soil.

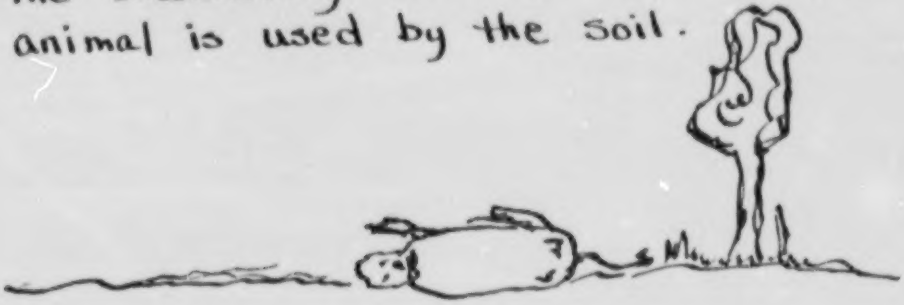

green plants
manure
waste
decay
n_2 ●
n_2 ●
n_2 - nitrates
● - bacteria

SOIL

All this was made in miniature for the children.

#3. Activity Sheet

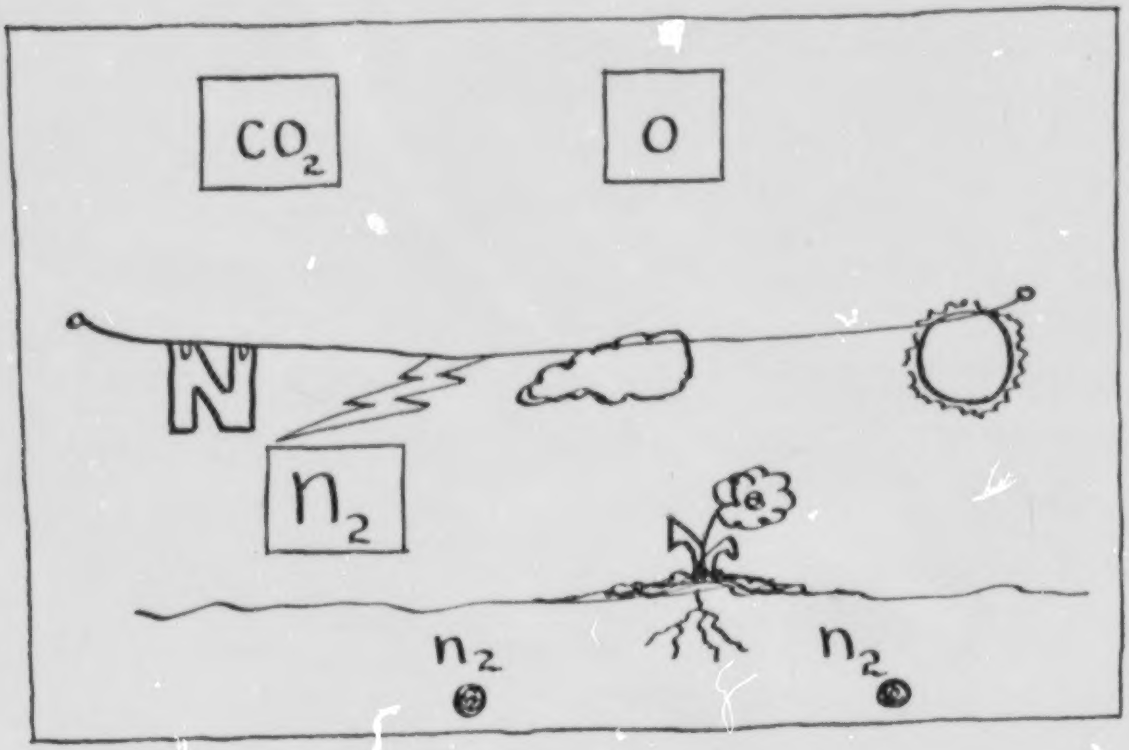
Look at the soil bulletin board. Use the vocabulary there to label how the dead animal is used by the soil.



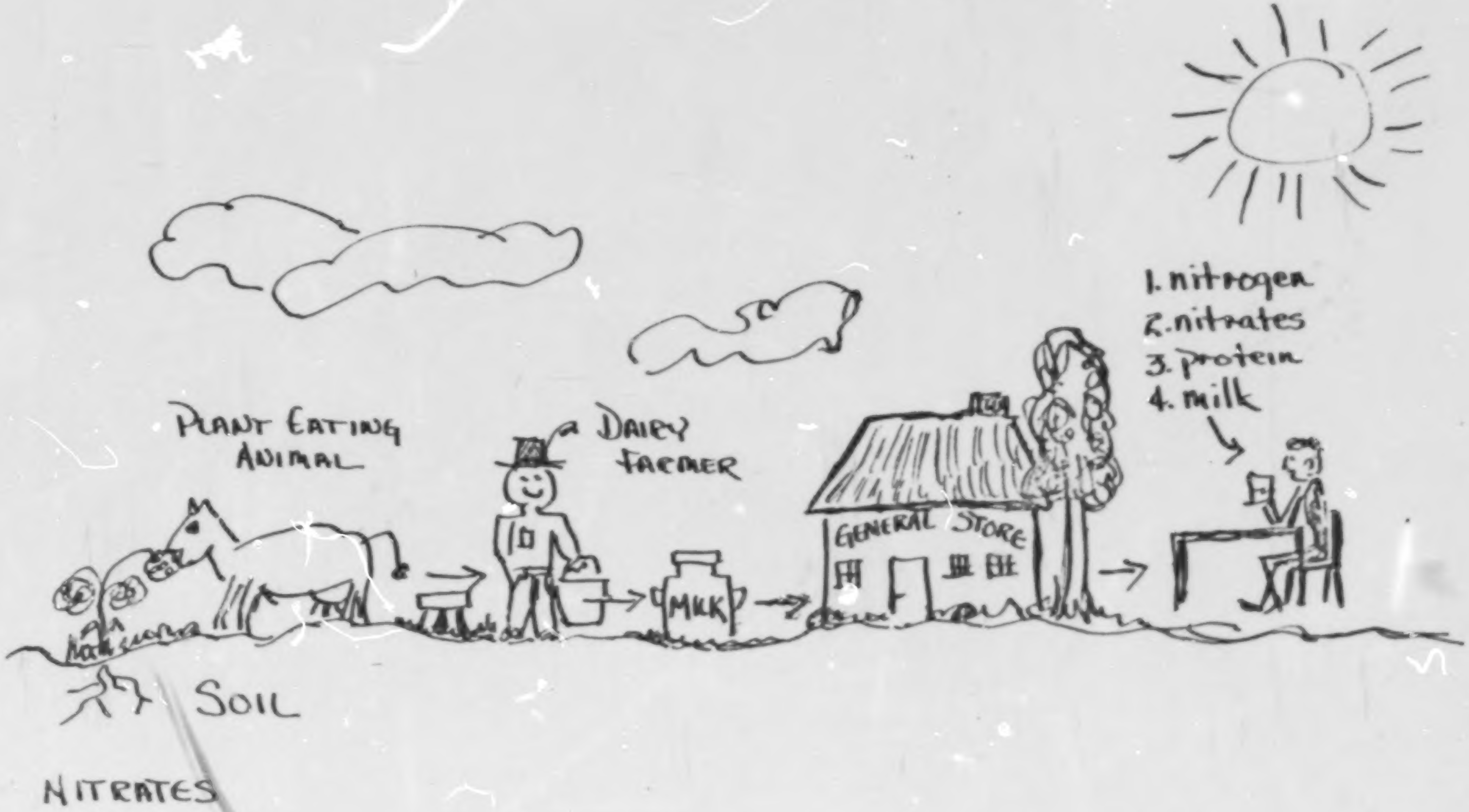
#4 TEST

In order to test the children's knowledge of the nitrogen cycle, all materials made in miniature were available for them to use for illustration.

The children were given manilla oak tag, 12" x 18", heavy string and paper clips upon which they could suspend their atmosphere. They were also given rubber cement with which to paste their soil materials.



How We Get Nitrogen


PLANT EATING ANIMAL
DAIRY FARMER
MILK
GENERAL STORE
1. nitrogen
2. nitrates
3. protein
4. milk
SOIL
NITRATES

How Does Your Body Get Rid of Wastes?

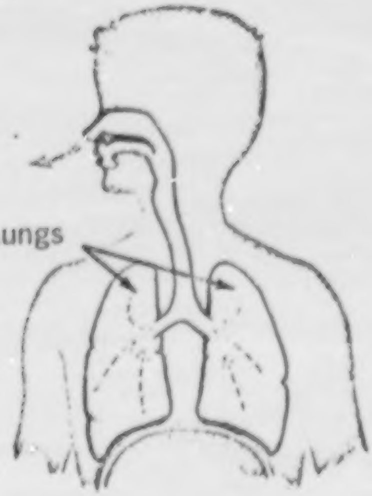
Most of the food that you eat is digested. But some parts of the food that you eat are not digested. These parts are called wastes. You get rid of these wastes when you go to the bathroom.

Your blood carries the digested food to your cells. To do work, your cells need energy. Even when you are very still, your cells need energy. As your cells turn the digested food into energy, they make a waste. The waste your cells make is a gas called **carbon dioxide** (KAR-bun dy-OK-syd). At this very minute, your cells are making carbon dioxide.

How does the carbon dioxide your cells make leave your body?

Carbon dioxide is carried away from the cells by the blood. Your blood carries the carbon dioxide from all your cells to your lungs. You know that you use your lungs when you breathe.

The carbon dioxide leaves your body each time you breathe out.



You cannot see carbon dioxide gas. How do you think scientists know that you are breathing out such a gas?

Scientists know that carbon dioxide will make the liquid called limewater turn cloudy. No other gas makes limewater turn cloudy. Scientists can use limewater to show that you are breathing out carbon dioxide.

Activity -
Go over to experiment table
and follow directions above.

limewater - straws
21 small containers of limewater

1 for each pupil teacher's group

(Ref. Richmond)

MAN'S CARELESSNESS

James Kelly

A bird's wings beat against the sky,
Soon he will again never fly.
   Why?
Because men don't hear his helpless cry,
The pollution keeps on rolling by,
A fish rolled over and died,
He had nowhere to hide.
Pollution came from every side;
Now a skeleton of the fish does glide
Along with the rapidly rising tide.
   Why?
Men had polluted the rivers with garbage and lye.
When each was blamed they all denied.
Each of them had too much pride,
But what about the fish that died?
And soon the world will all be dead.
Because man did not use his head.
And when wildlife is gone from here,
Will man's conscience become clear
Of the terrible things he's done?
Soon man won't be able to run.
Then he'll realize what he's done.
The battle against pollution must be won.

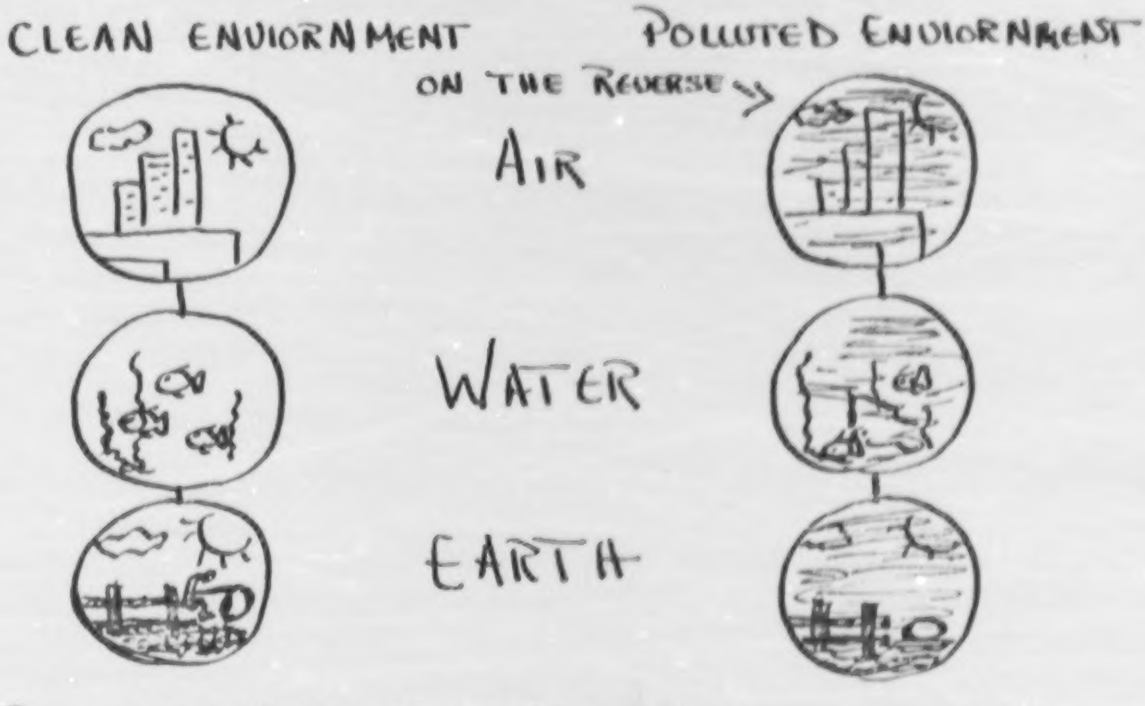
Motivation for Pollution Discussions

1. Teacher Taken Slides

10 SLIDES WERE TAKEN IN THE CHILDREN'S ENVIORNMENT ILLUSTRATING: WATER POLLUTION, AIR POLLUTION AND EARTH POLLUTION.

2. Picture Mobile

CARDBOARD COMMERCIAL POLLUTION PICTURES (DENNISON) DEPICTING AIR, WATER AND EARTH POLLUTION WERE MADE INTO MOBILES.

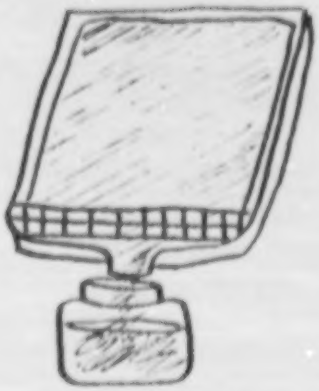

CLEAN ENVIORNMENT
POLLUTED ENVIORNMENT
ON THE REVERSE
AIR
WATER
EARTH

3. Pictures Were Used From: "Ecology – The Pollution Problem" By – Thomas J. Rillo

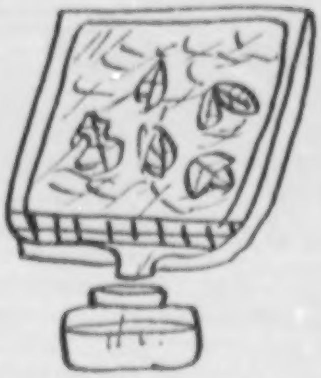
POLLUTION EXPERIMENTS ILLUSTRATED

#1.

A.



B.

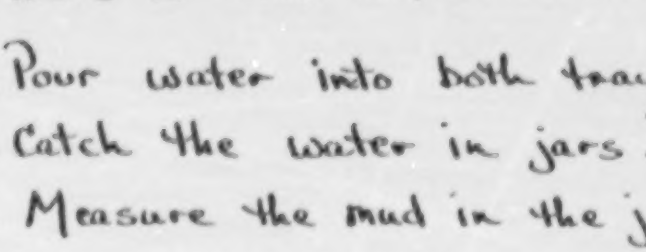


1. Fill two trays with soil. In the first tray there is just soil. In the second tray there is soil mixed with leaves and grass.

2. Pour water into both trays.
3. Catch the water in jars.
4. Measure the mud in the jars

THIS IS TO SHOW THE IMPORTANCE OF PLANTS IN CONSERVING SOIL.

#2. USE "BIRTH OF A TREE KIT" TO PLANT NORWAY SPRUCE SEEDS.



THE GROWING BLOCK IS placed INTO A CLEAN RECYCLED MILK CARTON TO GROW.

APPENDIX T

CORRESPONDENCE TO INTERESTED PEOPLE

Sample:

Date

Dear Sir:

We are involved in the development of an ecology unit based on the Philadelphia Primary Science Guide. It is an open classroom approach coupled with teacher demonstration.

The children are involved in learning center activities on Monday, Wednesday, and Friday afternoons and teacher demonstrations on Tuesday and Thursday afternoons from 1:00-3:00 p.m.

We would like for you to feel free to visit us at any time up to and including our Exhibition Day on May 31, 1:30-2:30 p.m.

We are novices in the area of science curriculum. But, we are aware that this is a neglected area of study for our children.

We would therefore appreciate your visit and opinion of our endeavor to improve the education of our children.

Sincerely,

3rd Grade, Jeanette Quinn
1st Grade, Elaine Carty

Note enclosed with children's letters.

Spring Garden School
12th & Ogden Sts.
Phila., Pa. 19123

April 10, 1973

WJLK Ecology Team
WJLK Radio
Press Plaza
Asbury Park, N. J. 07712

Dear Sir:

We would appreciate it very much if the children were to receive the Ecology pins offered by your station.

We are attempting to formulate a Primary Ecology Unit for the children. We are certain your pins will spur their interest and act as an incentive to learn more about ecology.

Please forward any other material you believe will help us to become more effective in this area.

There are sixty children in the combined classes.

Sincerely,

Jeanette Quinn

Elaine Carty

March 28, 1973

Academy of Natural Sciences
19th and The Parkway
Philadelphia, Pa. 19103

Education Department

Dear Sir:

We are teachers at Spring Garden School. Our classes had a trip planned for January 17 but because of the strike we could not come. We are very interested in the live animal show and the lesson on ecology.

Please send any written material you have available on the topic of ecology so that we may follow up in the classroom.

Sincerely,

Miss Jeanette Quinn

Miss Elaine Carty

2 copies

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THE SCHOOL DISTRICT OF PHILADELPHIA

MEMORANDUM

NAME AND OFFICE Mrs. Marilyn Meltzer, Principal Spring Garden School	FILE NO. 509
	DATE 5.16.73
NAME AND OFFICE Benjamin J. Kaplan	SENDER'S TELEPHONE WA 3-5270

Class Trip to Washington's Crossing Park
Tuesday, June 19, 1973

The trip for the children in Miss Carty's and Miss Quinn's classes to the above named park is approved. The use of the bus and the time of the trip as outlined in your letter is just fine.

I do feel that this trip will be a very useful one, both from the standpoint of education as well as pupil enjoyment.

/s

FORM S 30—MEMORANDUM—SCHOOL DISTRICT OF PHILADELPHIA (JUNE 1968)

APPENDIX U

ECOSYSTEM

Education Department

Academy of Natural Sciences
19th and the Parkway
Philadelphia, Pa. 19103

ECOSYSTEM

Ecological systems or ECOSYSTEMS are the basic unit of study for the general ecologist. Ecosystems come in all sizes and are found everywhere, but their size and location matter little. What is most important about the ecosystem is how the plants, animals, and non-living environment interrelate.

Take a small pond for example. Like every ecosystem, it can be analyzed in terms of four parts or roles. The pond will contain (1) ABIOTICS or non-living physical and chemical necessities such as water, oxygen, minerals, mud, and sunlight. (2) It contains PRODUCERS, green plants such as algae or water lillies, which through the process of photosynthesis, convert radiant energy (sunlight) to a chemical form (food) that can be used by consumers. (3) CONSUMERS are animals that receive the sun's energy via green plants, plant-eaters, or meat-eaters. Consumers in a pond could be a bass or frog, tadpole or dragonfly. (4) Finally, there are the DECOMPOSERS that break down complex organic compounds which make up plants and animals reducing them to minerals and nutrients that might be utilized again by another generation of organisms.

The study of ecosystems can be complicated because there is always so much happening. An ecosystem never stands still. Energy is flowing through the system, materials are being cycled and used over and over again as decomposers return organic materials into a state from which they can be used again. Plant and animal populations grow and decline as they constantly compete for the limited amount of energy that enters the ecosystem from the sun.

THINGS TO DO

1. Classroom ecosystem: Set up a classroom aquarium or terrarium. Your library has books that can help you. If possible, use plants, fish, snails, and crayfish from a local pond. Label the parts of your ecosystem. Is an aquarium self-sufficient? How is it different from a real pond? You can throw an aquarium ecosystem out of balance by exposing it to too much sunlight. Algae (producers) will grow beyond the ability of consumers (snails, some fish) to control them and the water will turn green. Do not let the algae grow too long or it will kill the fish.
2. Ecosystem walk: Go out into a vacant lot or your

school yard and identify the parts of a local ecosystem:

Producers

trees
grass
weeds
moss
dandelions

Consumers

ants
butterflies
robins
pigeons
bees
dogs
people

Decomposers

worms
garbage
bacteria
fungi (mushrooms)
rats
roaches

Physical Factors

water
sunlight
dirt
rocks
litter

Compare this ecosystem and its components to some in other parts of the world:

a grassland in Africa,

the ocean,

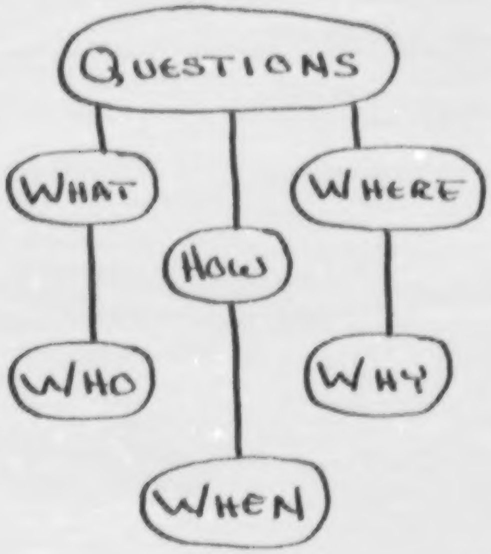
the tundra in Alaska.

APPENDIX V

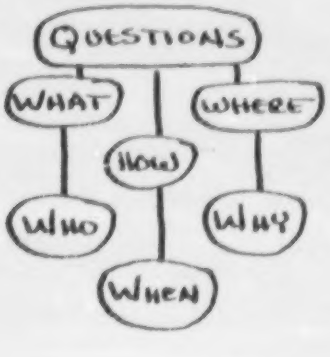
ENGLISH LESSON

ENGLISH LESSON

1. LEAD MOBILE


QUESTIONS
WHAT
HOW
WHERE
WHO
WHY
WHEN

2. ACTIVITY : CHILDREN ASSEMBLE THE LEAD MOBILE IN MINIATURE.


QUESTIONS
WHAT
HOW
WHERE
WHO
WHY
WHEN

APPENDIX W

SIGN-UP SHEET

WEEKLY SIGN-UP SHEET

ECOLOGY LESSONS!

Sign up to visit us during this time:

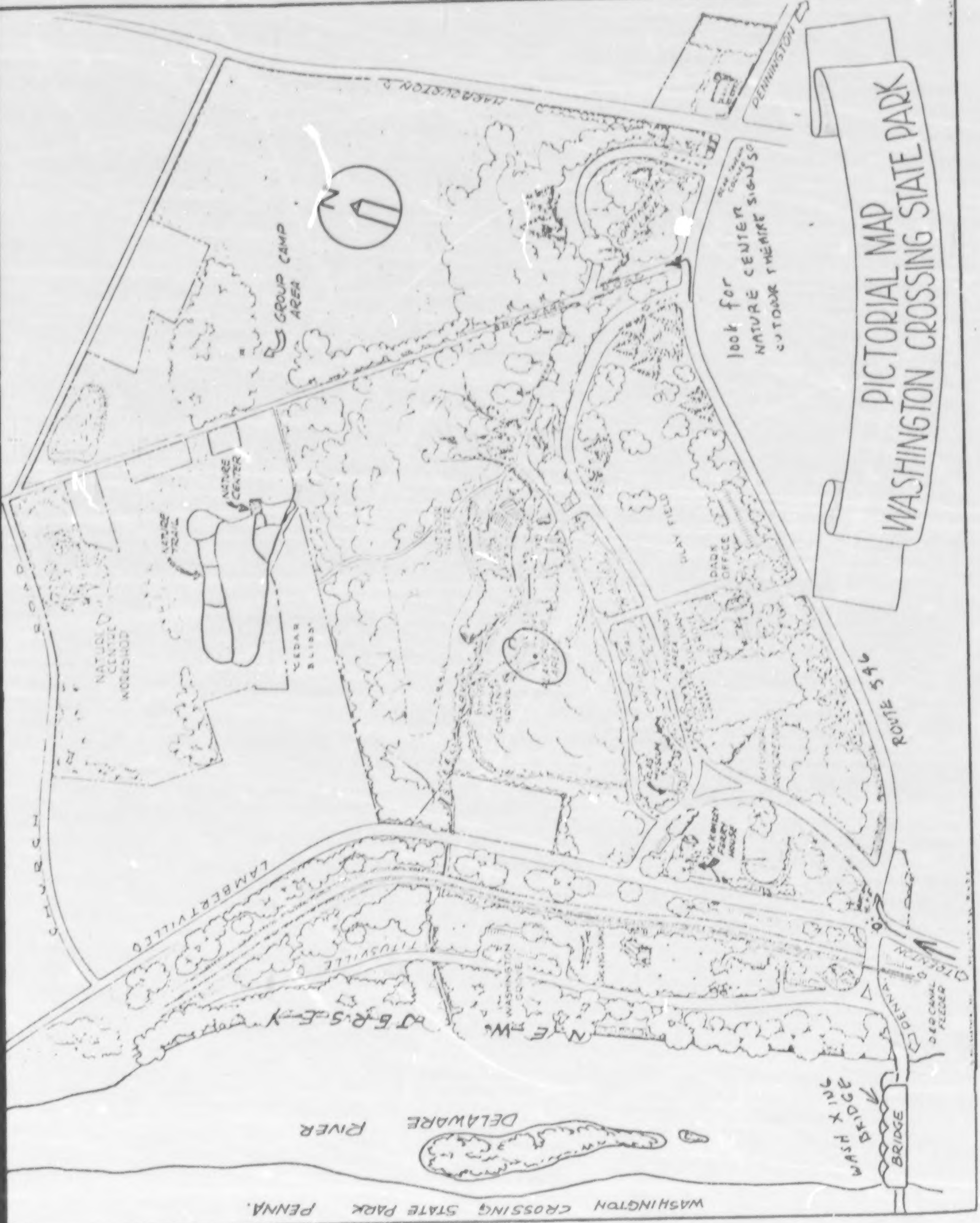
		Class
Tuesday	1:15-2:00 p.m.	________________
	2:15-3:00 p.m.	
Thursday	1:15-2:00 p.m.	________________
	2:15-3:00 p.m.	

One class per time period.

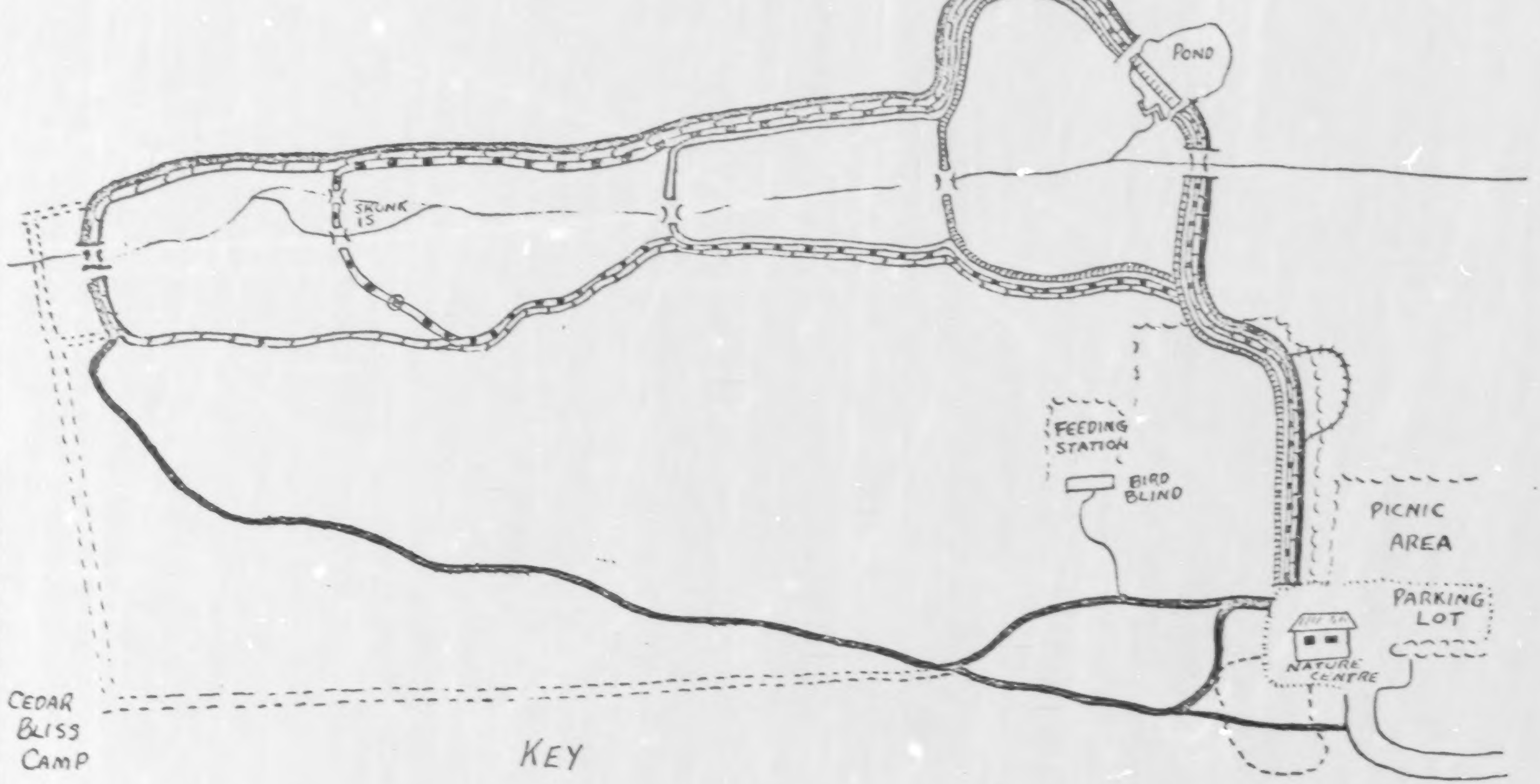
Come See Us--Room 202

APPENDIX X

MAPS FOR WASHINGTON CROSSING STATE PARK


PICTORIAL MAP
WASHINGTON CROSSING STATE PARK
look for
NATURE CENTER
OUTDOOR THEATRE SIGNS
PENNINGTON
HARBOURTON
N
GROUP CAMP AREA
NATURE CENTER
NATURE TRAIL
NATURE CENTER WORKSHOP
CEDAR BLIND
CHURCH ROAD
PLAY FIELD
PARK OFFICE
FLAG MUSEUM
FERRY HOUSE
ROUTE 546
LAMBERTVILLE
TITUSVILLE
WASHINGTON GROVE
NEW JERSEY
D&R CANAL FEEDER
PENNINGTON
WASH XING BRIDGE
BRIDGE
DELAWARE RIVER
WASHINGTON CROSSING STATE PARK PENNA.

MAP OF TRAILS


POND
SKUNK IS
FEEDING STATION
BIRD BLIND
PICNIC AREA
PARKING LOT
NATURE CENTRE
CEDAR BLISS CAMP

KEY

SWAMP TRAIL .... YELLOW ▤
SPRING BEAUTY TRAIL...... WHITE ▭
BIRD WATCHER'S TRAIL...... GREEN ▭
RED CEDAR TRAIL .... BLUE ▭
LOIS SHOEMAKER TRAIL ...... RED ▬
BIRD BLIND TRAIL .... —
ALTERNATE LOOP.......... .. ┼┼┼

(COLORS MARKED ON TREES)

Trail is approximately 1 mile aroun

REVISED 4/8/72

APPENDIX Y

SUPPLIES FOR LESSONS

SUPPLIES FOR LESSONS

Opaque projector

Film projector

Filmstrip projector

Record player

Two hand mirrors

Plants

Peat pots

Seeds

Soil

Water and containers

Tin foil

Cotton

Two flannel boards

Two jars

Two flat pans

Ice cubes

Bread

Jar lids

Spirit masters

Duplication paper

Stapler and staples

Fasteners

Paper clips

Chalk

Rubber cement

Various sized tables

Black crayons

Magic markers

Paint cloths

Pulleys

Rhythm instruments

Waste baskets

Large brown envelopes
    6" x 9"
    13" x 10"
    9" x 12"

Small labels for jars

Flower pots

Plastic name tags with pins

Manila folders--9" x 12"

Pointers

Crayons

Pen and ink

Stamp and stamp pad

Cardboard boxes

Dowel sticks

Yarn

Pencils

Pens

Experience chart paper

Scissors

Straight pins

Plastic bags

Construction paper--12" x 18" assorted

Poster board

Brushes

Water color paint

Boxes

Water pans

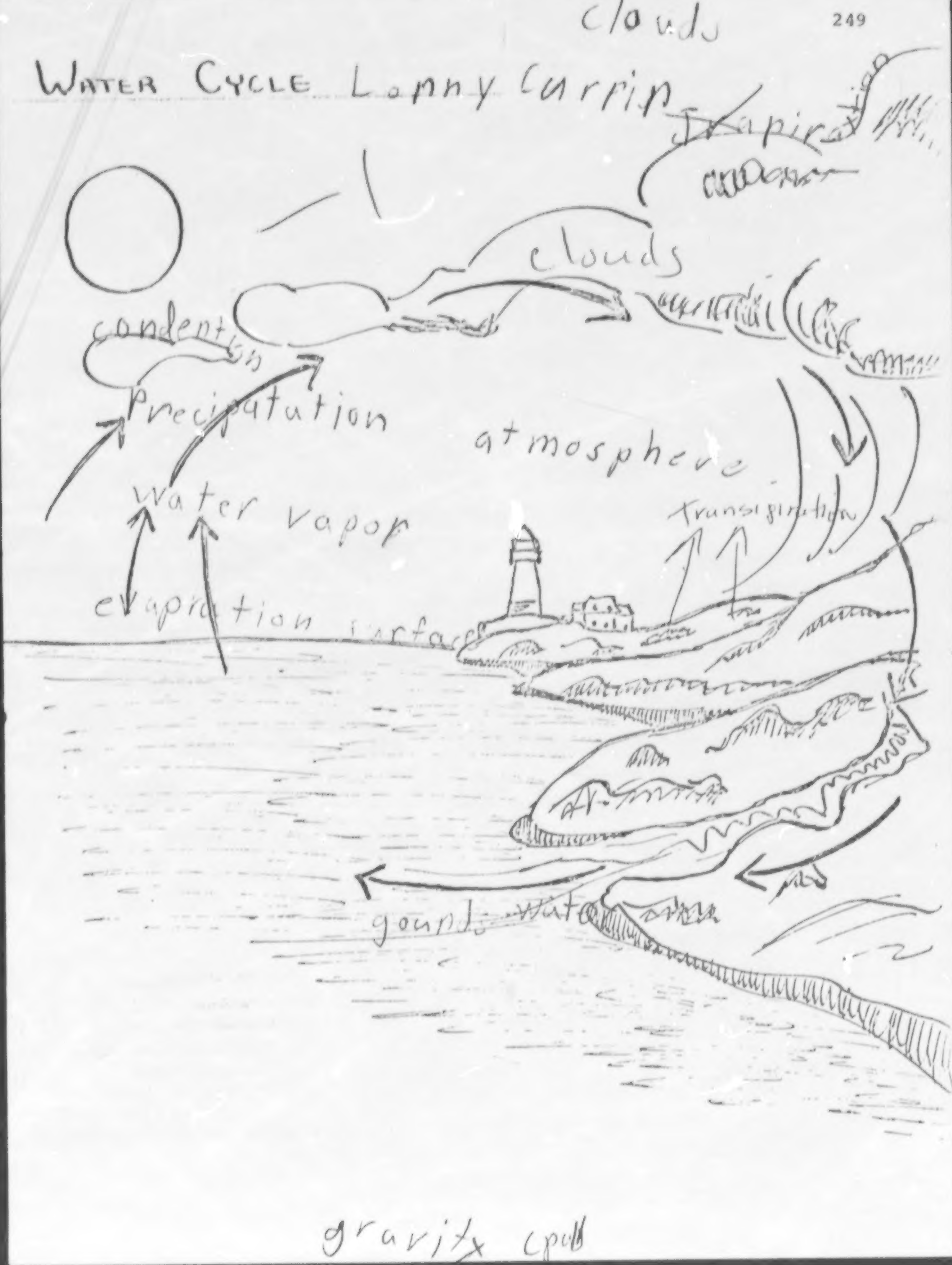
Safety pins

Assorted color chalk

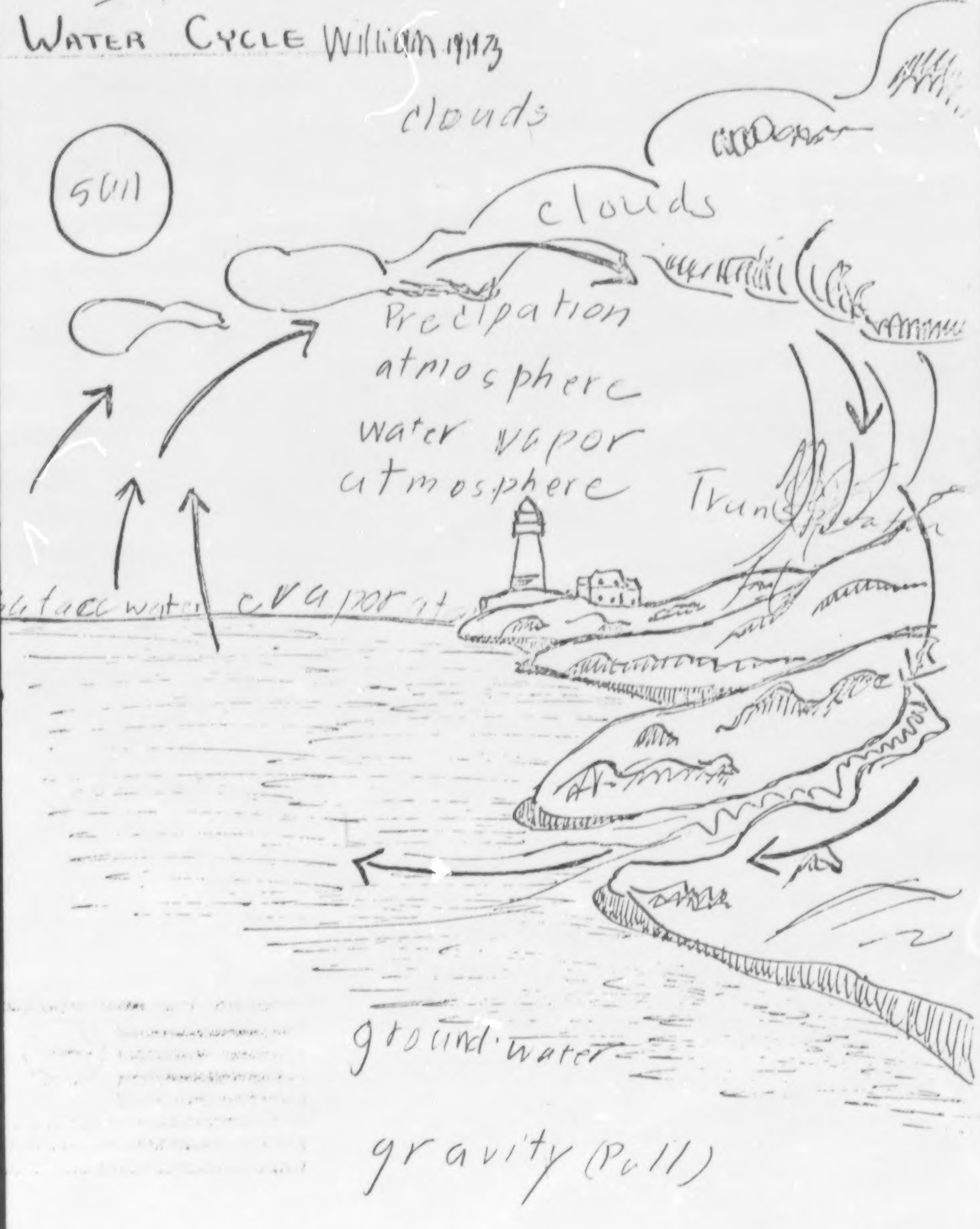
APPENDIX Z

CHILDREN'S WORK

WATER CYCLE Lonny Carrin

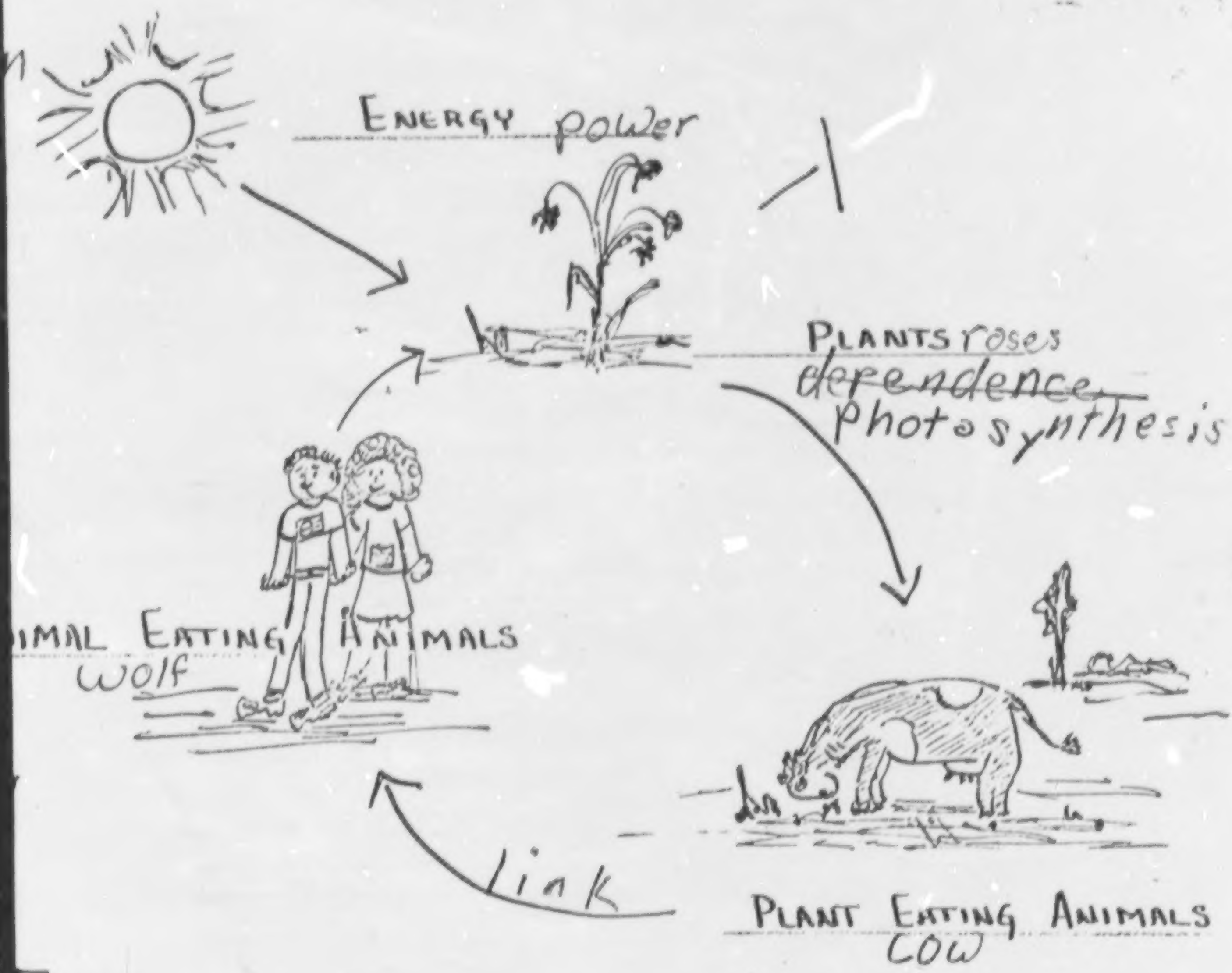

clouds
Evapiration
clouds
condention
Precipatation
atmosphere
water vapor
Transigiration
evapiration
surface
gounds water
gravity cpull

WATER CYCLE William 1983

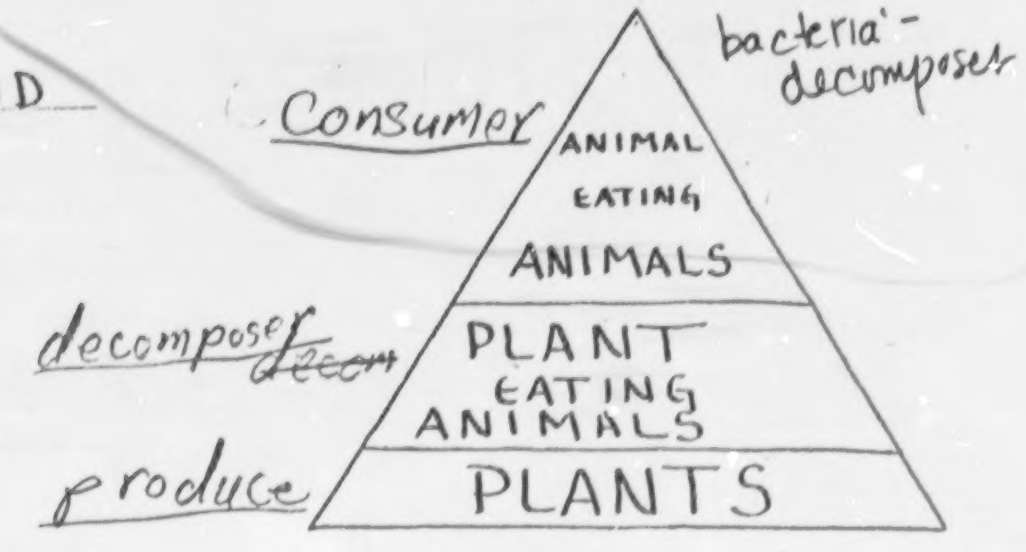

clouds
sun
clouds
Precipation
atmosphere
water vapor
atmosphere
Transpiration
surface water
evaporation
ground water
gravity (Pull)

Melisa Dixson May 3, 1973

FOOD CHAIN Cycle

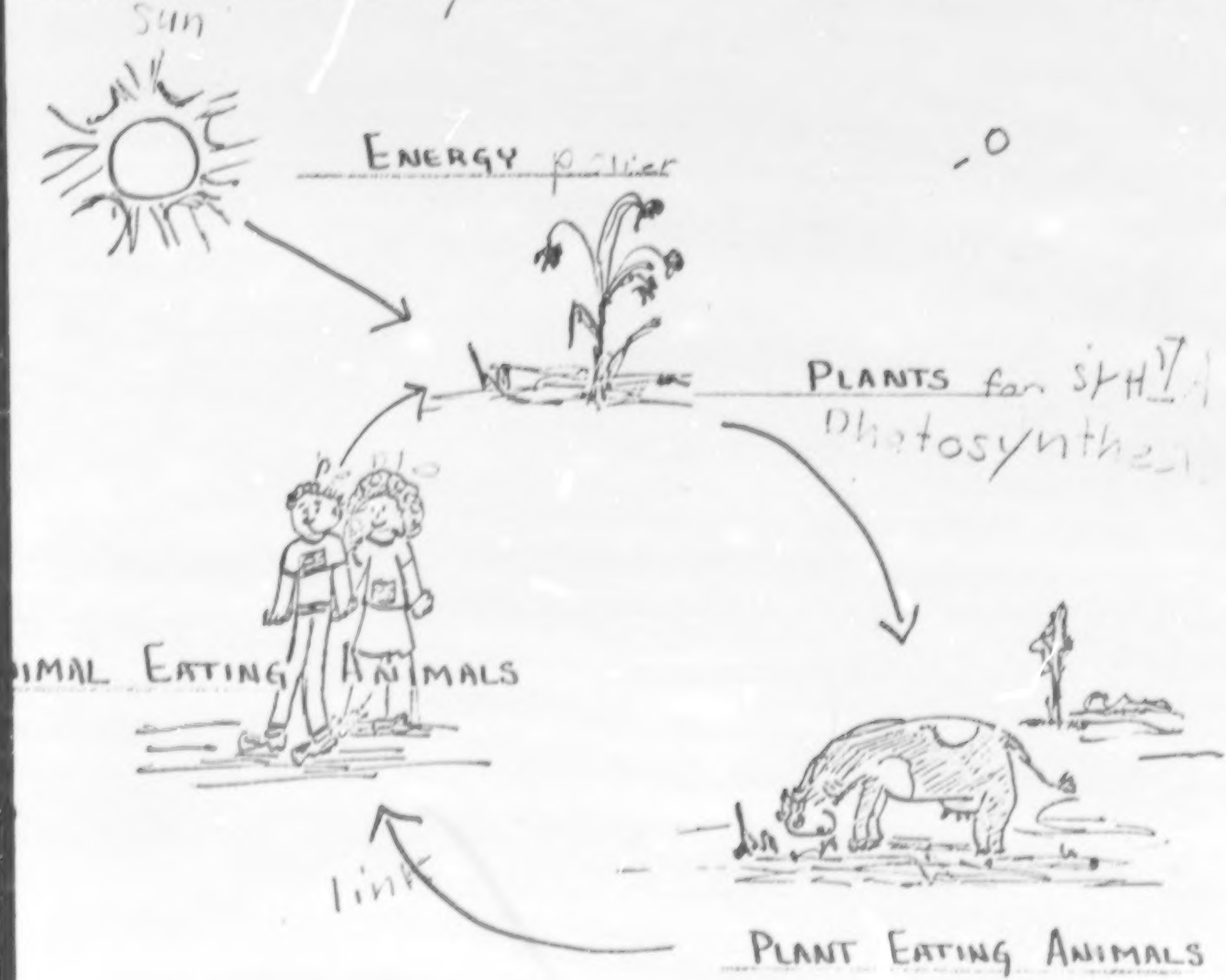

ENERGY power
PLANTS roses
~~dependence~~
Photosynthesis
PLANT EATING ANIMALS
COW
link
IMAL EATING ANIMALS
wolf

FOOD PYRAMID

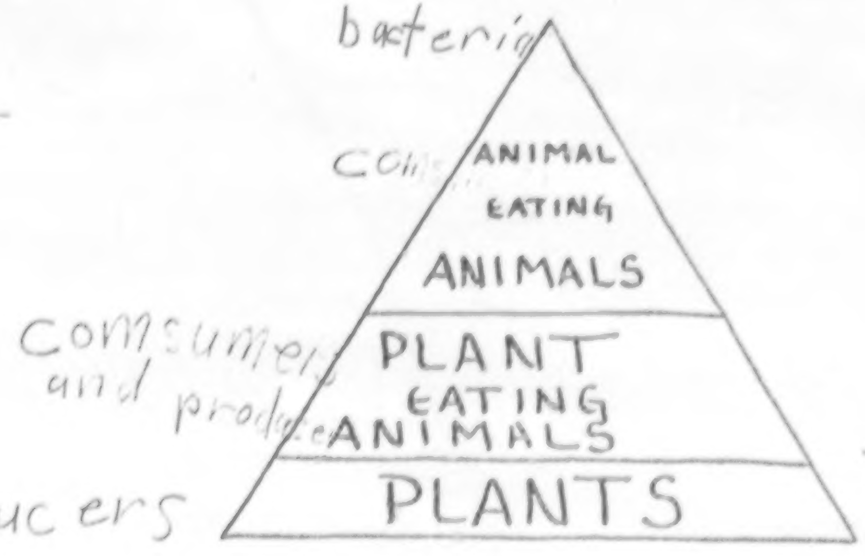

bacteria-
decomposer
Consumer
ANIMAL
EATING
ANIMALS
decomposer ~~decom~~
PLANT
EATING
ANIMALS
produce
PLANTS

Andreaux Anderson May 3, 1973

FOOD CHAIN Cycle


Sun
ENERGY power
PLANTS fon syH
Photosynthes
people
IMAL EATING ANIMALS
link
PLANT EATING ANIMALS

FOOD PYRAMID


bacteria
Cons
ANIMAL EATING ANIMALS
consumers and producers
PLANT EATING ANIMALS
producers
PLANTS

APPENDIX AA

PICTURES TAKEN DURING THE COURSE OF THIS STUDY